

December 2021

Assessing base costs at PR24

About this document

This document outlines our current thinking on our approach to assessing base costs at PR24. We are keen to build on our PR19 approach, which was largely supported by the Competition and Markets Authority (CMA), and will look to make improvements for PR24 where appropriate.

We have received some helpful feedback and suggestions in response to our PR24 May consultation '[Creating tomorrow, together](#)' and through a discussion forum with companies – a cost assessment working group (CAWG), and are looking for detailed feedback in response to this paper on the following topics ahead of the PR24 draft methodology:

- principles of PR24 base cost assessment;
- approach to developing and selecting econometric wholesale base cost models;
- improving the cost adjustment claim process;
- forward-looking capital maintenance;
- cost-service relationship; and
- considering the impact of Covid-19 when assessing residential retail costs.

We also want to use the paper to identify additional data requirements that may improve our approach to assessing base costs.

Executive summary

For the next price review in 2024, PR24, the water sector in England and Wales faces a series of long-term challenges. Together, we need to tackle the demands from climate change and respond to customers' increasing expectations around service and treatment of the environment, while recognising pressures on customers' ability to pay their water bills.

At the last price review, PR19, some companies really stepped up their commitments to improve services while reducing costs. To be able to meet the challenges the sector is facing, it is vital that all water companies efficiently deliver the outcomes that matter to customers and the environment.

Water and wastewater companies are monopolies, which do not face direct competition for many of the services that they provide. In the absence of competition, companies may not be sufficiently incentivised to deliver cost efficiencies or reveal efficient costs. We therefore need to develop our own independent view of efficient costs so that customers do not pay more than is needed to achieve these outcomes.

This paper sets out our thinking on our approach to assessing base costs at PR24. Base costs are routine, year-on-year costs, which companies incur in the normal running of their business to provide a base level of good service to customers and the environment and maintain the long-term capability of assets. Base costs make up around 80% of all costs incurred by water companies, and cover wholesale and residential retail activities. Ensuring base costs are efficient will therefore be critical to meeting the long-term challenges for the sector.¹

We use econometric cost benchmarking models as our main tool to determine efficient base cost allowances. Benchmarking allows us to compare costs across companies, helping to overcome information asymmetry - that is companies knowing more about their efficient costs than we do. Econometric cost benchmarking uses statistical methods to benchmark companies' costs, taking into account factors which are largely beyond companies' control. We have confidence in our PR19 base cost econometric models, developed through an extensive consultation process, which began in 2016.² We have had extensive input from the sector and the models are consistent with engineering insight, and our approach to assessing wholesale base costs was validated in the Competitions and Markets Authority's (CMA's) PR19 redeterminations.³

¹ See Ofwat, '[PR24 and beyond: Long-term delivery strategies and common reference scenarios](#)', November 2021 for detail on our approach to long-term delivery strategies at PR24.

² Ofwat, '[Cost assessment for PR19: a consultation on econometric cost modelling](#)', March 2018.

³ Competition and Markets Authority. '[Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations, final report](#)', March 2021.

We are therefore keen to build on our PR19 approach and, where appropriate, make improvements for PR24, taking account of the lessons learnt from PR19.⁴ This paper discusses our ideas and proposals for improving our approach to assessing base costs at PR24. We include our reflections on feedback and suggestions we have received from water companies in response to our PR24 May consultation '[Creating tomorrow, together](#)' and through a discussion forum with companies – the cost assessment working group (CAWG). This paper looks to continue our collaborative approach with the sector.

The majority of ideas and proposals we discuss in this paper relate to wholesale base costs, but some of the issues explored also apply to residential retail cost assessment, as indicated throughout.

We summarise the key ideas and proposals discussed in this paper below.

⁴ Ofwat, '[PR24 and beyond: Our reflections on lessons learnt from PR19](#)', December 2020, pp. 63-68.

Table 0: Summary of PR24 base cost assessment proposals

Chapter	Summary
Principles of PR24 base cost assessment	<ul style="list-style-type: none"> • We have identified six core principles that should underpin our base cost assessment approach at PR24. The approach should be: <ul style="list-style-type: none"> ○ consistent with engineering, operational and economic rationale; ○ sensibly simple (ie avoid unnecessary complexity) and transparent; ○ focused on cost drivers that are outside of company control (ie, exogenous cost drivers); ○ use econometric cost models that can accurately predict and forecast efficient wholesale base costs and be robust to scrutiny; ○ set a stretching but achievable cost efficiency challenge; and ○ be part of a coherent cost assessment approach.
Approach to wholesale base cost modelling at PR24	<ul style="list-style-type: none"> • Our PR19 wholesale base cost models represent a significant improvement to PR14 and were validated by the CMA. We are keen to build on our PR19 modelling approach and will look to make improvements for PR24 where appropriate. • Scope of wholesale modelled base costs - refers to the costs included within our econometric wholesale base cost models. At PR24, we propose to start with the PR19 scope of wholesale modelled base costs and consider making amendments based on a set of criteria (see section 3.1 for details). The exception to this is bioresources, which we propose to assess separately from other wholesale wastewater costs at PR24. • Wholesale base cost modelling suite – we propose to use wholesale base cost models at different levels of cost aggregation to determine efficient cost allowances where feasible at PR24. This approach accounts for trade-offs between disaggregated and more aggregated cost models. The former can enable a wider range of cost drivers to be captured in the cost assessment approach, whereas more aggregated cost models capture interactions between different services of the value chain. • Wholesale base cost drivers and explanatory variables enable us to compare costs between companies and over time. This in turn enables us to set a stretching but achievable cost efficiency challenge. We are open to considering additional or alternative cost drivers and explanatory variables that will improve our econometric models at PR24. • Sample period selection – refers to the length of the dataset used to estimate our econometric base cost models. This could include historical outturn data (2011-12 onwards) and potentially PR24 business plan forecast data. At PR19 we relied on historical outturn data only. Our working assumption for PR24 is to utilise the full historical data series available to develop the base cost models. We are also open but cautious to the possibility of including business plan forecasts. • Model estimation method – we propose to maintain the use of random effects to estimate our base econometric cost models at PR24.
Cost adjustment claims	<ul style="list-style-type: none"> • We will retain the use of a cost adjustment claim process at PR24 and will maintain a high evidential bar. • We aim to improve the clarity of cost adjustment claim guidance to facilitate the development of well-evidenced claims and to reduce the number of poorly evidenced claims. We also aim to increase the availability of cross-sector data to enable well-evidenced cost adjustment claims to be developed, and to facilitate the wider application of symmetrical cost adjustments.
Capital maintenance and asset health	<ul style="list-style-type: none"> • The CMA considered that our PR19 cost assessment approach provided adequate funding for capital maintenance. But the CMA also suggested that we consider developing forward-looking indicators that would enable us to enhance our assessment of capital maintenance expenditure with a forward-looking element. • We are therefore exploring how we could incorporate more of a ‘forward look’ into our wholesale base cost assessment approach at PR24. • We are also keen to explore additional asset health measures that may help to provide insight into levels of asset health at a sector level, future capital maintenance activity requirements, and to demonstrate if the future maybe different to the past We have

	<p>collated a long list of potential asset health measures (see Chapter 5) which we seek feedback on.</p>
<p>Cost-service relationship</p>	<ul style="list-style-type: none"> • Our ambition for PR24 is to build on our PR19 approach to setting cost allowances and performance levels to better understand what base buys and where possible draw a more explicit link between cost allowances and the service levels we set (ie the cost-service relationship). • Our proposed approach to exploring the cost-service relationship is split in two key questions: <ul style="list-style-type: none"> ○ What does base buy? ○ What cost adjustments are necessary if the performance commitment (PC) level differs from what base buys? • This paper focuses on the first question. To determine what base buys, we propose to: <ul style="list-style-type: none"> ○ evaluate if performance delivered by base should be expressed as a common performance level or a company specific performance level; ○ determine an appropriate initial baseline performance level for an efficient company in 2024-25 ('Year 0'); and ○ forecast the performance level deliverable from base for an efficient company by 2029-30 and over the longer term. • We propose to use a range of information to determine what performance level can be delivered from base, including: <ul style="list-style-type: none"> ○ historical outturn performance data up to and including 2022-23; ○ PR19 performance commitment levels for 2023-24 and 2024-25; ○ PR19 business plan forecasts; and ○ companies' PR24 business plan forecast of what base buys. • We also discuss the viability of econometric modelling approaches to explore the cost-service relationship, including: (i) modelling the cost-service relationship for individual PCs (eg leakage); and (ii) combining multiple PCs into a composite variable. • We continue to explore potential approaches to making cost adjustments to allowances when companies proposed performance commitment levels for the 2020-25 period differ from those expected to be delivered from base.
<p>Residential retail cost assessment</p>	<ul style="list-style-type: none"> • We intend to ask companies to separate out the part of their provision of bad debt costs relating to Covid-19 that was made outside of their standard methodology in the PR24 business plan tables. We are interested to understand if companies have any comments regarding this proposed approach.

Responding to this consultation

We would welcome any comments on this document. Please email them to CostAssessment@ofwat.gov.uk or post them to:

Assessing base costs at PR24: Consultation response
Ofwat
21 Bloomsbury St
Bloomsbury
London WC1B 3HF

The closing date for this consultation is **Thursday 3 February 2022**. If you wish to discuss any aspect of this consultation, please contact Daniel Mitchell by email at CostAssessment@ofwat.gov.uk.

We intend to publish responses to this paper on our website at www.ofwat.gov.uk. Subject to the following, by providing a response to this consultation you are deemed to consent to its publication.

If you think that any of the information in your response should not be disclosed (for example, because you consider it to be commercially sensitive), an automatic or generalised confidentiality disclaimer will not, of itself, be regarded as sufficient. You should identify specific information and explain in each case why it should not be disclosed [and provide a redacted version of your response], which we will consider when deciding what information to publish. At a minimum, we would expect to publish the name of all organisations that provide a written response, even where there are legitimate reasons why the contents of those written responses remain confidential.

In relation to personal data, you have the right to object to our publication of the personal information that you disclose to us in submitting your response (for example, your name or contact details). If you do not want us to publish specific personal information that would enable you to be identified, our [privacy policy](#) explains the basis on which you can object to its processing and provides further information on how we process personal data.

In addition to our ability to disclose information pursuant to the Water Industry Act 1991, information provided in response to this [type of document], including personal data, may be published or disclosed in accordance with legislation on access to information – primarily the Freedom of Information Act 2000 (FoIA), the Environmental Information Regulations 2004 (EIR) and applicable data protection laws.

Please be aware that, under the FoIA and the EIR, there are statutory Codes of Practice which deal, among other things, with obligations of confidence. If we receive a request for disclosure of information which you have asked us not to disclose, we will take full account of

your explanation, but we cannot give an assurance that we can maintain confidentiality in all circumstances.

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1. Introduction

1.1 Aims of this document

This paper outlines our current thinking on our approach to assessing base costs at PR24. It discusses our ideas and proposals for improving our approach to assessing base costs at PR24. It also includes our reflections on feedback and suggestions we have received from water and wastewater companies in response to our PR24 May consultation '[Creating tomorrow, together](#)' and through a discussion forum with companies – the cost assessment working group (CAWG).

We have engaged positively with water companies to date. But a number of companies have raised that they sometimes find it challenging to engage with material presented during the CAWG meetings. Some companies have responded to our suggestion of providing written feedback following the CAWG meetings, but others welcome the opportunity to respond to a formal consultation instead.

Our intention is that this paper will give companies and other stakeholders an opportunity to provide detailed feedback on our proposals and offer additional suggestions to explore ahead of the draft PR24 methodology. It will also focus companies and wider stakeholders on areas of our base cost assessment approach that are more likely to require additional consideration and data collection ahead of the methodology, such as:

- additional / alternative explanatory variables that could improve our econometric base cost models;
- additional data collection that may facilitate high-quality symmetrical cost adjustment claims;
- provision of data to support exploration of the relationship between cost and service; and
- incorporating more of a 'forward-look' into our assessment of capital maintenance expenditure and the reporting of additional asset health measures.

This is particularly important given our aspiration to provide companies with an early indication of potential base cost models as well as greater clarity over potential cost adjustments (eg in late 2022 or early 2023).

We are keen to continue to engage with stakeholders to help us improve our approach to assessing base costs. We welcome thoughts on the ideas and options explored in this paper. We are also keen to hear views on any alternative approaches or options you think should be considered.

We note that bioresources costs may be assessed separately from other wholesale wastewater base costs at PR24. More details are provided in '[Our proposed approach to funding bioresources activities at PR24](#)'. In addition, while the majority of ideas and proposals

we discuss in this paper relate to wholesale base costs, some of the issues explored also apply to residential retail cost assessment, as indicated throughout.

1.2 The context

For the next price review in 2024, PR24, the water sector in England and Wales faces a series of long-term challenges. Together, we need to tackle the demands from climate change and respond to customers' increasing expectations around service and treatment of the environment, while recognising pressures on customers' ability to pay their water bills.

At the last price review, PR19, some companies really stepped up their commitments to improve services while reducing costs. Given the challenges the sector is facing, it is vital that all water companies efficiently deliver the outcomes that matter to customers and the environment. Otherwise, it will not be possible to meet all the challenges facing the water sector.

Water and wastewater companies are monopolies, which do not face direct competition for many of the services that they provide. In the absence of competition, companies may not be sufficiently incentivised to deliver cost efficiencies or reveal efficient costs. We therefore need to develop our own independent view of efficient costs so that customers do not pay more than is needed to achieve these outcomes.

This paper sets out our thinking on our approach to assessing base costs at PR24. Base costs are routine, year-on-year costs, which companies incur in the normal running of their business to provide a base level of good service to customers and the environment and maintain the long-term capability of assets. Base costs make up around 80% of all costs incurred by water companies, and cover wholesale and residential retail activities. Ensuring base costs are efficient will be critical to meeting the long-term challenges for the sector.⁵

We use econometric cost benchmarking models as our main tool to determine efficient base cost allowances as they allow us to compare costs across companies, helping to overcome information asymmetry (ie companies know more about efficient costs than we do). This approach uses statistical methods to benchmark companies' costs taking into account factors which are largely beyond companies' control. In our PR19 wholesale econometric base cost models we benchmarked operating expenditure (opex) and capital maintenance expenditure (capex) together with some enhancement activities driven by population growth that share similar characteristics and cost drivers.

We recognise that econometric models may not explain all variations in efficient base costs between companies and over time. We therefore complement econometric analysis with cost adjustment claims. These provide companies with an opportunity to present evidence of

⁵ See Ofwat, '[PR24 and beyond: Long-term delivery strategies and common reference scenarios](#)', November 2021 for detail on our approach to long-term delivery strategies at PR24.

operating circumstances or legal requirements that are not explained by the cost drivers in the econometric models and drive higher efficient costs for the company relative to its peers.

Some base costs were not included in our econometric base cost models because they are largely outside the control of the company or because they are driven by specific regional requirements. Some examples are business rates and abstraction charges. We assessed these costs, known as unmodelled base costs, separately.

We have confidence in our PR19 base cost econometric models. They have been developed through an extensive consultation process, which began in 2016.⁶ We have had extensive input from the sector and the models are consistent with engineering insight, and our approach to assessing wholesale base costs was largely validated in the Competitions and Markets Authority's (CMA's) redeterminations.⁷

As mentioned in our PR24 May consultation '[Creating tomorrow, together](#)', we are keen to build on our PR19 approach and, where appropriate, will make improvements for PR24, taking account of the lessons learnt from PR19.⁸ We received some helpful feedback and suggestions in response to the consultation and through the CAWG series and are looking for further positive engagement via this paper. The table below sets out the topics we have discussed through the CAWG to date.⁹

Table 1.1 cost assessment working group topics in 2021

Date	Topics
15 April 2021	<ul style="list-style-type: none"> • Terms of reference for the group • What problems are we trying to solve? • Wholesale base/enhancement cost boundary • Potential approaches to the water resources control
26 May 2021	<ul style="list-style-type: none"> • Removing potential capex bias • How do we reflect future capital maintenance needs in cost assessment?
23 June 2021	<ul style="list-style-type: none"> • Leakage and metering information
15 July 2021	<ul style="list-style-type: none"> • Cost assessment principles • Scope of modelled base costs • Base cost drivers and explanatory variables
19 August 2021	<ul style="list-style-type: none"> • Residential retail
7 September 2021	<ul style="list-style-type: none"> • Average pumping head and other wholesale base cost data issues
14 September 2021	<ul style="list-style-type: none"> • Cost and service link

⁶ Ofwat, '[Cost assessment for PR19: a consultation on econometric cost modelling](#)', March 2018.

⁷ Competition and Markets Authority. '[Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations, final report](#)', March 2021.

⁸ Ofwat, '[PR24 and beyond: Our reflections on lessons learnt from PR19](#)', December 2020, pp. 63-68.

⁹ CAWG slides and meeting notes are available on our website here: <https://www.ofwat.gov.uk/regulated-companies/price-review/2024-price-review/pr24-working-groups-and-workshops/>

28 September 2021	<ul style="list-style-type: none"> • Forward looking capital maintenance assessment
12 October 2021	<ul style="list-style-type: none"> • Assessing growth-related costs
11 November 2021	<ul style="list-style-type: none"> • Cost adjustment claims

1.3 Structure of the document

The remainder of this paper is structured as follows:

- Chapter 2 outlines the principles of base cost assessment we propose to follow at PR24 that will help to ensure a positive outcome for customers and water companies.
- Chapter 3 presents our proposed approach to developing and selecting wholesale base econometric cost models at PR24.
- Chapter 4 sets out how we propose to improve the cost adjustment claim process.
- Chapters 5 and 6 provide a deep-dive into two key areas that have been discussed at CAWG meetings: capital maintenance and the cost-service relationship.
- Chapter 7 discusses how to consider the impact of Covid-19 when assessing residential retail costs at PR24.

The following issues related to base costs are out of scope for this paper, and will be explored in more detail in the PR24 draft methodology:

- independent forecast of base cost drivers;
- catch-up efficiency challenge;
- frontier shift; and
- cost sharing and other cost related reconciliation mechanisms.

1.4 Next steps

We want to hear views on the ideas and proposals in this document from water companies, their customers and representative groups, regulators and other stakeholders. **We invite written submissions by 5pm on 3 February.** We are also open to holding a webinar/workshop with stakeholders to discuss the contents of the paper if helpful.

The responses to this document we receive will help to inform our approach to assessing base costs at PR24 as we move towards our draft methodology in June/July 2022. We will also continue to engage with the water companies through the CAWG, and continue to welcome contributions from across the sector and beyond to the [Future Ideas Lab](#).

2. Principles of PR24 base cost assessment

Principles of PR24 base cost assessment: summary

- We recognise the importance of establishing principles of base cost assessment to provide confidence to the sector that the cost assessment decisions we make at the price review are justified and well evidenced.
- We have identified six core principles that should underpin our cost modelling approach at PR24:
 - consistent with engineering, operational and economic rationale;
 - sensibly simple and transparent;
 - focused on exogenous cost drivers;
 - Incorporate robust exogenous cost drivers;
 - set a stretching but achievable cost efficiency challenge; and
 - form part of a coherent cost assessment approach.

Cost assessment draws upon a variety of powerful and flexible tools but ultimately requires an element of informed judgement and trade-offs to make effective decisions. For example, there is unlikely to be a set of econometric cost models that are deemed satisfactory by all water companies and other stakeholders because the ‘perfect model’ does not exist.

We therefore recognise the importance of **establishing principles of base cost assessment** ahead of the price review. They should provide confidence to the sector that the decisions we make at the price review are justified and well-evidenced.

At PR19 we aimed to develop econometric cost models that were:¹⁰

- **consistent** with engineering, operational and economic rationale; and
- **sensibly simple** and captured the key cost drivers.

We aim to build on our principles of base cost assessment at PR24. United Utilities proposed the following set of principles in its Future Ideas Lab paper on [‘The Principles of Regulatory Cost Assessment’](#), which it presented at the CAWG in July 2021. United Utilities’ proposed set of cost assessment principles are summarised below:

- Principle 1: Define the services provided to enable cost assessment to be structured.
- Principle 2: Prioritise engineering and economic rationale within cost assessment.
- Principle 3: Protect the benchmark’s independence (eg exogenous cost drivers).
- Principle 4: Ensure efficient expenditure outside of the modelled historical period (ie can the historical cost models accurately predict efficient expenditure in the future).

¹⁰ Ofwat, [‘PR19 final determinations. Securing cost efficiency technical appendix’](#), December 2019, p. 16.

- Principle 5: Ensure there is a coherent approach to cost benchmarking and the wider framework.
- Principle 6: Challenge efficiency with a transparent, objective and stable framework.

Water companies were reasonably supportive of the principles identified by United Utilities.¹¹ We have taken on board the feedback received at the CAWG meeting, and built on our PR19 cost assessment approach, to identify six core principles that should underpin our base cost assessment approach at PR24. These are set out in the figure below.

Figure 2.1: Ofwat principles of base cost assessment



We provide more details on our proposed base cost assessment principles below.

2.1 Consistent with engineering, operational and economic rationale

We will aim to develop econometric cost models that are consistent with engineering, operational and economic understanding of the underlying cost drivers. This approach ensures that the models used to estimate efficient base cost allowances capture the key cost drivers, and that the resulting efficiency analysis reflects 'actual' differences in relative efficiency instead of other factors.

¹¹ CAWG, '[Cost assessment principles, scope of modelled base costs, and base cost drivers and explanatory variables](#)', 15 July 2021.

2.2 Sensibly simple and transparent

The CMA considered that Ofwat's PR14 econometric cost models were overly complex. This led to a set of models the CMA considered were challenging to interpret and produced counter intuitive results in some cases.

We addressed the CMA's comments at PR19 by developing base cost models that were sensibly simple (without pursuing simplicity for its own sake) and captured the main cost drivers in each model. Companies generally supported the 'sensibly simple' modelling approach as it provided more transparency and clarity compared to PR14. This approach led to a set of models that the CMA supported and used to in the PR19 redeterminations.

We will therefore maintain the use of the 'sensibly simple' modelling approach at PR24. We will consider the introduction of additional complexity if the benefits of doing so (eg increased accuracy of our independent efficient cost baseline) clearly outweigh the costs (ie reduced transparency and levels of stakeholder engagement).

2.3 Focus on exogenous cost drivers

Cost drivers relate to factors that cause costs to differ between companies and over time. They can be grouped into 'exogenous' and 'endogenous' cost drivers:

- **exogenous cost drivers** relate to factors that are outside of company control (eg scale and population density), and cannot be influenced through the choices and actions of water companies; and
- **endogenous cost drivers** relate to factors that are subject to management influence.

We propose to focus on using 'exogenous' rather than 'endogenous' cost drivers / explanatory variables when developing our wholesale base econometric cost models at PR24.¹² We applied the same principle at PR19, which was strongly supported by the CMA.¹³

The focus on exogenous cost drivers helps to ensure the independence of our estimate of efficient base costs, which in turn incentivises companies to reveal true efficient costs when submitting their business plans. It also avoids the risk of perverse incentives. For example, the inclusion of an endogenous cost driver may incentivise a water company to change its investment strategy in the knowledge that it could lead to a higher cost allowance at the next price review.

¹² Explanatory variables relate to data that is used to proxy the cost driver (eg customer numbers are used as a proxy of company scale).

¹³ Competition and Markets Authority. '[Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations. Final report](#)', March 2021, pp. 171-177.

We recognise, however, that it can be challenging to identify truly exogenous cost drivers / explanatory variables. Particularly as the water industry is asset intensive, and many variables may be under management control in the long-term (eg network length).

We consider it is therefore important to distinguish between cost drivers and explanatory variables that are under management control in the short term (eg performance or workload cost drivers) from those that are only endogenous in the long term (eg network length). The former are more likely to generate perverse incentives than the latter. As a result, we would be very cautious about including cost drivers / explanatory variables in the base econometric models that are endogenous in the short term. But would be more open to including cost drivers that are only endogenous in the long term given the risk of perverse incentives is reduced.

2.4 Robust econometric cost models

The econometric cost models used to determine efficient base cost allowances should accurately predict and forecast efficient costs and be robust to scrutiny. To achieve this, we will assess the performance of the econometric cost models against a range of model robustness tests, as set out in chapter 3.

We will also aim to triangulate between models of different levels of cost aggregation to ensure we do not rely on any one model to estimate efficient costs, which will mitigate the risk of error and bias. Bioresources may be the exception to this principle given the ambition to assess bioresources costs separately from other wholesale wastewater costs at PR24.¹⁴

2.5 Set a stretching but achievable cost efficiency challenge

In a competitive market, less efficient companies would be unable to charge a premium to customers to cover their inefficiency. As monopoly providers of an essential service, water companies do not face competitive market pressures. We must therefore set cost allowances that are efficient to protect the interest of current and future customers.

A stretching but achievable cost efficiency challenge will encourage lagging companies to catch-up with the leading companies in the sector at a fast pace (ie catch-up efficiency), and encourage leading companies to accelerate their improvement (ie ongoing efficiency).

We will continue to use econometric benchmarking analysis to identify relatively efficient companies within the sector and set a catch-up efficiency challenge to the less efficient companies in the sector. We recognise that models are imperfect and are likely to include an

¹⁴ Ofwat, '[Our proposed approach to funding bioresources activities at PR24](#)', December 2021.

element of statistical noise, which means setting the catch-up efficiency challenge at the frontier company may not be achievable for most companies.

We therefore propose to use a range of evidence to select an appropriately stretching but achievable catch-up efficiency challenge at PR24. We will exercise our regulatory judgement to set the catch-up efficiency challenge taking into account a range of evidence such as:

- econometric model robustness and quality;
- historical cost efficiency analysis;
- forward looking cost efficiency analysis;
- catch-up efficiency challenges set at previous price reviews and by other regulators in comparator sectors; and
- external cost benchmarking analysis (eg with companies operating in other sectors)

2.6 Coherent cost assessment approach

It is vital that our approach to cost assessment is joined up and coherent. We will work collaboratively to ensure that decisions related to base costs, enhancement costs, and cost adjustment claims are all made on a consistent basis, and interdependencies are clearly identified. This will reduce the risk of our efficient cost allowances being under- or over-estimated (eg double counting).

As stated in our PR24 May consultation '[Creating tomorrow, together](#)', we are considering publishing the base cost models early at PR24 so that companies can take account of their relative efficiency when developing their PR24 business plans. This should subsequently support the development and assessment of robust cost adjustment claims (if required). We will also place greater focus on the application of symmetrical cost adjustments at PR24, which should improve the coherence of our approach (see chapter 4).

The interactions between cost assessment and other aspects of the regulatory framework (eg, outcomes, risk and return) will also be carefully considered. The relationship between cost assessment and outcomes is explored in more detail in chapter 6.

2.7 Consultation questions

Principles of PR24 base cost assessment

1. Do you agree with our principles of base cost assessment?
2. Do you consider any important principles are missing?

3. Approach to wholesale base cost modelling at PR24

Approach to wholesale base cost modelling: summary

- Our PR19 wholesale base cost models represented a significant improvement over the models used at PR14, and were validated by the CMA. We are keen to build on our PR19 modelling approach and will look to make improvements for PR24 where appropriate.
- **Scope of wholesale modelled base costs** – at PR24, we propose to start with the PR19 scope of wholesale modelled base costs, and consider making amendments based on a set of criteria. The exception to this is bioresources, which we propose to assess separately from other wholesale wastewater costs at PR24.
- **Wholesale base cost modelling suite** – we propose to continue to use wholesale base cost models at different levels of cost aggregation to determine efficient cost allowances where feasible at PR24. We plan to reassess the feasibility of developing wastewater network plus base cost models at PR24 (ie sewage collection and sewage treatment).
- **Wholesale base cost drivers and explanatory variables** – the PR19 wholesale base cost drivers and explanatory variables provide a good starting point for PR24 as they are aligned with our cost assessment principles and were validated by the CMA. But we are open to considering additional or alternative cost drivers and explanatory variables that will improve our econometric models at PR24.
- **Sample period selection** – our working assumption for PR24 is to utilise the full historical data series available (2011-12 onwards) to develop the wholesale base cost models. We are also open but cautious about the possibility of including business plan forecasts into our econometric wholesale base cost models if there is strong evidence to suggest that the historical period is not a good reflection of the future.
- **Model estimation method** – we propose to maintain the use of random effects to estimate our wholesale econometric wholesale base cost models at PR24.
- **Model selection process** – our PR19 wholesale base cost models went through a rigorous model selection process and were supported by the CMA. We therefore propose to follow the same approach at PR24.

We consider our PR19 wholesale base cost models represent a **significant improvement** to those used at PR14. The PR19 wholesale base cost models were developed through an extensive consultation process¹⁵, with extensive input from the sector, and were validated by the CMA at the PR19 redeterminations.

¹⁵ Ofwat, '[Cost assessment for PR19: a consultation on econometric cost modelling](#)', March 2018.

We set out in our PR24 May consultation '[Creating tomorrow, together](#)' that we are keen to build on our PR19 modelling approach and, where appropriate, will make improvements for PR24. We introduced some of the issues currently under consideration. Namely:

- **Scope of wholesale modelled base costs** relates to the costs included in our wholesale base cost econometric models. We introduced the possibility of developing total expenditure (totex) models at PR24 and set out our intention to reassess whether it is appropriate to assess growth related costs separately from wholesale base costs at PR24.
- **Cost drivers** explain variations in efficient costs between companies and over time. We recognised the PR19 wholesale base models included a wide range of key cost drivers, but invited suggestions for additional / alternative cost drivers to consider at PR24.
- **Disaggregated cost models** can allow the use of specific cost drivers for certain elements of the supply chain that can be difficult to capture in more aggregated models (eg wholesale). We set our intention to improve consistency of cost reporting to help develop robust disaggregated cost models at PR24.

In response to our PR24 May consultation, companies generally agreed with our proposed approach (ie build on PR19 approach and make improvements where appropriate). They suggested the focus at PR24 should be on improving data quality and considering new or different cost drivers and explanatory variables.

This chapter presents our current thinking on our approach to wholesale base cost modelling at PR24, reflecting on the lessons learnt from PR19, and feedback and suggestions received in response to our PR24 May consultation '[Creating tomorrow, together](#)' and through the CAWG series. We highlight areas where we are open to, or are considering, change and welcome views from stakeholders on the options proposed.

We note that parts of this chapter are also relevant to residential retail (namely, sample period selection, model estimation method, and the model selection process).

We list each of the topics discussed in the remainder of this chapter below:

- scope of wholesale modelled base costs;
- wholesale base cost modelling suite;
- wholesale base cost drivers and explanatory variables;
- sample period selection;
- model estimation method; and
- model selection process.

3.1 Scope of wholesale modelled base costs

The definition of wholesale modelled base costs interacts with enhancement cost assessment, wholesale unmodelled base cost assessment, and cost adjustment claims. We

therefore recognise the importance of defining the scope of wholesale modelled base costs to ensure a coherent cost assessment approach.

At PR19, the scope of wholesale modelled base costs included wholesale base costs (opex plus capital maintenance) and some capex enhancement activities that shared similar characteristics with wholesale base costs (eg costs driven by population growth).

The scope of wholesale modelled base costs at PR19 is summarised in the table below.

Table 3.1: PR19 scope of wholesale modelled base costs

Wholesale water modelled base costs	Wholesale wastewater modelled base costs
Wholesale base costs	
Opex	Opex
Capital maintenance	Capital maintenance
Capex enhancement activities included in wholesale modelled base costs	
New developments	New development and growth
New connections element of new developments	Growth at sewage treatment works
Low pressure	Reduce flooding risk for properties
	Transferred private sewers and pumping stations

But we also excluded a small number of opex items (ie those referred to as unmodelled base costs at PR19) whose characteristics made them more suitable for separate assessment (eg they are largely outside the control of the company driven by specific regional requirements). These included business rates, costs associated with the Traffic Management Act (TMA), third party costs, pension deficit recovery payments, non-section 185 diversions, abstraction and discharge service charges, and wastewater Industrial Emissions Directive costs.¹⁶

In our PR24 May consultation '[Creating tomorrow, together](#)', we said we would consider the merits in developing total expenditure (totex) econometric models at PR24 as part of our modelling suite. We said this could help to avoid cost assessment being distorted by differences in cost allocation between wholesale base and enhancement. Companies largely disagreed with this proposal because they considered the lumpiness of enhancement expenditure would be challenging to capture in the econometric models. Instead, they suggested the inclusion of additional costs in the wholesale base cost models would need to be based on a clear assessment framework. Some companies also suggested assessing growth-related costs separately from wholesale base costs.

We discussed the issue in more detail at the CAWG meeting 'Cost assessment principles, scope of modelled base costs, and base cost drivers and explanatory variables' 15 July 2021, and Severn Trent Water presented a potential framework for testing changes to model scope.

¹⁶ This relates to the costs of administering existing Industrial Emissions Directive (IED) permits.

We also discussed the assessment of growth-related expenditure at the October 2021 CAWG meeting.¹⁷

We reflect on the comments and feedback received from companies below, which cover the following topics:

- costs included in wholesale modelled base costs;
- growth-related expenditure; and
- other pre-modelling cost adjustments.

3.1.1 Costs included in our wholesale base cost models

As stated in our PR24 May consultation '[Creating tomorrow, together](#)', we are open to considering different ways of combining costs within our wholesale econometric cost models at PR24. We also agree with companies that we should use criteria to consider making amendments to the definition of costs included in our wholesale base cost models at PR24. Particularly as the CMA validated the scope of wholesale modelled base costs at PR19.¹⁸ The exception to this is bioresources, which we propose to assess separately from other wholesale wastewater base costs at PR24.¹⁹

At PR24, **we propose to start with the PR19 scope of wholesale modelled base costs (excluding bioresources) and consider making amendments based on the following criteria.** Our proposal takes on board the framework suggested by Severn Trent Water, which was largely supported by companies at the CAWG meeting.

¹⁷ CAWG meeting slides and notes are available here: <https://www.ofwat.gov.uk/regulated-companies/price-review/2024-price-review/pr24-working-groups-and-workshops/>

¹⁸ Competition and Markets Authority. '[Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations. Final report](#)', March 2021, pp. 117-392.

¹⁹ Ofwat, '[Our proposed approach to funding bioresources activities at PR24](#)', December 2021.

Table 3.2: proposed criteria for adjusting scope of wholesale modelled base costs at PR24 (excluding bioresources)

Criterion	Candidate for exclusion / separate assessment	Candidate for inclusion in wholesale modelled base costs
1	Companies have not incurred these costs in the past.	Companies have incurred these costs in the past.
2	Variations in costs between companies and over time cannot be explained by the cost drivers in the wholesale base cost models.	Variations in efficient costs between companies and over time can be explained by the cost drivers in the wholesale base cost models.
3	Costs can be clearly identified, and data reporting inconsistencies and/or interactions / complementarities with wholesale base costs are minimal (necessary but not sufficient condition for separate assessment).	Costs cannot be clearly identified. Inclusion in wholesale modelled base costs mitigates data reporting inconsistencies and allows for interactions / complementarities with wholesale base costs.
4	Robust standalone econometric / unit cost models can be developed (necessary but not sufficient condition for separate assessment).	Robust standalone econometric / unit cost models cannot be developed.
5	Costs are largely outside of company control.	Costs are largely inside of company control.

Overall, we consider **the inclusion of a broad range of costs** in the wholesale base cost models can better account for cost complementarities and trade-offs. This is demonstrated by that fact that other regulators, including Ofgem at RIIO-GD2,²⁰ include a larger proportion of costs in their main econometric cost models. Potential candidates for exclusion / separate assessment must therefore demonstrate that alternative solutions are not more appropriate and/or proportionate. For example:

- Are costs sufficiently material to warrant separate assessment?
- Can costs be explained through amendments to the wholesale base cost models, such as alternative / additional explanatory variables or an amended model sample period?
- Is an ex-post modelling adjustment more appropriate?

We welcome thoughts from the sector on potential amendments to the scope of wholesale modelled base costs and explain how the potential amendment can be justified based on the proposed assessment framework illustrated above.

3.1.2 Growth-related expenditure

At PR19, **we benchmarked growth-related expenditure with wholesale base costs**. We considered this integrated approach to be appropriate because growth and wholesale base costs share similar characteristics (eg companies incur these costs on a year-by-year basis and can be explained by similar cost drivers such as scale and density) and to mitigate known

²⁰ See Ofgem RIIO-GD2 final determination, where Ofgem used a single top-down total expenditure econometric cost model to determine efficient costs as they considered this approach better accounts for cost complementarities, trade-offs and potential reporting inconsistencies. See Ofgem, '[RIIO-GD2 Final Determinations: Step-by-Step Guide to Cost Assessment](#)', December 2020.

reporting inconsistencies. We complemented the wholesale base cost models with a separate growth unit cost adjustment, deep dives of business plan evidence, and a developer services revenue adjustment (DSRA) reconciliation mechanism.²¹ The CMA largely validated our approach to assessing growth-related costs at the PR19 redeterminations, with minor amendments to our separate growth unit cost adjustment and the DSRA.²²

Data limitations related to growth expenditure made it challenging to develop robust standalone growth models at PR19.

- **Standalone growth model results may be misleading because of cost reporting differences between operating, capital maintenance and growth-related expenditure.** For example, some companies reported zero costs under historical new connections capex because they reported the costs as opex instead. The Regulatory Accounting Guidelines (RAGs) also allow companies to apply a level of discretion when proportioning costs between growth-related expenditure and capital maintenance. As a result, standalone growth model results may be misleading.
- **Limited growth cost driver information available.** The main cost driver data available was related to scale (eg number of new connected properties) and density, both of which were reflected in our approach to assessing wholesale base costs. Companies identified a range of other potential drivers of growth-related expenditure (eg, mix of connection types, self-lay provider market penetration, growth intensity, remoteness of growth), but limited comparative data was available. We therefore sought to capture them in different ways through our approach to assessing wholesale base costs (eg, the separate growth unit cost adjustment and deep dives of business plan evidence).

Since PR19, we have carried out work to reduce cost reporting inconsistencies, and to capture more growth cost driver information, as summarised in the box below.

²¹ In addition, the bioresources control was a modified average revenue control.

²² Competition and Markets Authority. '[Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations. Final report](#)', March 2021, pp. 293-329.

Growth data improvements made since PR19

Growth expenditure

We amended the reporting of growth expenditure lines in companies' Annual Performance Reports (APRs), starting from 2020–21, to reduce the risk of reporting inconsistencies between companies. The amended reporting aligns the definition of growth expenditure lines to the developer services charging lines (eg, new connections, mains requisition, network reinforcement). Companies are also required to report on growth opex in addition to growth capex.

Growth cost driver and explanatory variables

Companies are required to report information on new connections, properties and length of mains split by incumbent and self-lay providers (SLPs), and by new appointments and variants (NAVs) for new properties.

Additional data has also been submitted through our '[Gathering data about developer services data request](#)', which requested information on site-specific developer services work. In particular, companies provided the following data on financially closed new development projects in 2020–21:

- services required (eg infill connections; new mains and associated connections; new mains and associated connections and mains diversion);
- connection type (standard versus non-standard);
- household or non-household;
- traffic management;
- number of connections and properties connected – by incumbent, SLP and NAV;
- length of main and communication pipe – by incumbent, SLP and NAV;
- percentage of contestable work undertaken by the incumbent / SLP; and
- costs and revenues.

We plan to collect similar data as part of the APR process moving forward.

We expect further improvements in the data to be required to enable standalone assessment of growth-related expenditure, as explained below.

In response to our PR24 May consultation, companies generally considered that growth-related expenditure should be removed from wholesale base costs and assessed or modelled separately at PR24, despite the data limitations listed above. Some companies also suggested that site-specific growth costs (eg service connections and new mains) should be assessed separately from other growth costs (eg, network reinforcement, growth at sewage treatment works, and risk of sewer flooding). We invite companies to **explain if/how the removal of growth-related costs from the wholesale base cost models can be justified based on the proposed criteria set out in Table 3.2.**

We expect that **further data improvements** are likely to be required to enable growth costs to be assessed separately from wholesale base costs at PR24 in a robust way. In particular:

- Concerns around the allocation of costs **between growth and capital maintenance** have not been resolved. Some companies have also expressed concerns on the allocation of overheads.²³ We therefore invite suggestions on how these potential cost reporting inconsistencies can be resolved for PR24.
- We also consider that **additional cost driver and explanatory variable data is likely to be needed for network reinforcement and wider growth costs** (eg growth at sewage treatment works and risk of sewer flooding). We therefore invite detailed proposals on additional industry data we could collect and accompanying definitions.
- The growth data improvements that have been made in the latest APR are **only reflected from 2020-21 data**. We are therefore also interested to understand whether it might be feasible to submit historical data on the same basis (eg back-cast to 2011-12).

Anglian Water have also proposed potential areas for additional growth data collection to inform PR24 and PR29 in the growth CAWG workshop (summarised below), and we welcome feedback on their suggestions in response to this consultation.

²³ We note that on 26 October 2021 we published [IN 21/03 Regulatory accounting guidelines 2021-22](#) which included our revised [RAG 2.09 – Guideline for classification of costs across the price controls](#). This sets out our revised approach to allocating overhead costs which will apply at PR24. RAG 2.09 gives enhanced guidance to the allocation of General and Support expenditure and new guidance for the allocation of regulation costs.

Table 3.3 Anglian Water's suggested areas for additional growth data collection

Network reinforcement	Water recycling treatment
Property capacity created by investment in pumping stations and pipes.	Existing flow compliance headroom in catchments where funding required.
Length of pipe laid, capacity/diameter, depth, number of infrastructure crossings (eg rail) and ground type.	Consistency review of reporting guidance for allocation of expenditure between growth and maintenance.
Number of pumping stations built or upgraded	Number or scale of sites where permit compliance is 'beyond available technology'.
More granular reporting of costs, new build, mitigation/incremental upgrade, conveyance.	
Consistency review of reporting guidance for allocation of expenditure, review of interpretation of 'local distribution network' and boundary between expenditure directly linked to new development sites, or generic investment to maintain existing levels of service in the face of population growth.	

Source: Anglian Water's presentation at CAWG, 'Assessing growth-related costs', 12 October 2021.

In the absence of improved data at PR24, **our PR19 approach to assessing growth expenditure provides a pragmatic solution to the assessment of growth expenditure at PR24** and was supported by the CMA.²⁴

3.1.3 Other pre-modelling cost adjustments

There are a number of other issues to consider when defining the scope of wholesale modelled base costs at PR24. We summarise these below:

²⁴ We will provide further details on our proposed approach to regulating developer services at PR24 in the draft methodology.

Table 3.4: Other pre-modelling cost adjustments

Other pre-modelling cost adjustments	Description
Treatment of grants and contributions	The PR19 wholesale base cost models were developed before the deduction of grants and contributions (G&Cs) to ensure that the relationship between costs and cost drivers was not distorted by different levels of G&Cs between companies. We do not propose to amend the treatment of G&Cs when developing wholesale base cost models at PR24.
Treatment of enhancement opex	<p>Companies did not distinguish between wholesale base and enhancement opex in their historical annual data submissions, which meant the opex included in the PR19 wholesale base cost models related to both wholesale base and enhancement. We subsequently made an ex-post enhancement opex implicit allowance adjustment to avoid double counting, given that the enhancement cost assessment was conducted on a total expenditure basis. The approach was validated by the CMA at the PR19 redeterminations.</p> <p>From the 2020–21 APR onwards, companies will report enhancement opex separately from wholesale base opex. We are therefore considering amending our treatment of enhancement opex in the wholesale base cost models at PR24. More details will be provided in the draft methodology.</p>
Implications of improvements in cost allocation reporting guidance	<p>Our review of the bioresources market identified a number of issues with the allocation of costs between the bioresources control and other controls. Earlier in the year, we provided guidance on how best to account for sludge liquor costs, energy generation revenues and overheads.</p> <p>Full implementation of our cost allocation guidance will be reflected in companies' shadow reporting from the reporting year 2021–22 onwards. This would provide only a small amount of historical data that we could use at PR24. By comparison, at PR19 our wholesale base cost econometric models included data back to 2011–12.</p> <p>We are therefore proposing that companies submit adjusted historical data back-casted to 2011–12 alongside their regulatory reporting for 2021–22 that reflects the recent cost allocation guidance. We consider this would help ensure our econometric models can estimate an appropriate efficiency challenge for wastewater network plus activities and bioresources.²⁵</p>
Treatment of atypical expenditure	<p>Atypical expenditure items are defined as unusual items outside of ordinary activities in the APR.²⁶ Up to 2019–20, companies excluded atypical expenditure items from the related cost line in the APR (eg other opex). This led to atypical expenditure being excluded from wholesale base cost econometric models at PR19.</p> <p>As a result of a change in regulatory accounting guidelines, companies included atypical expenditure items in the related cost line in their 2020–21 APR submissions. This means that atypical expenditure items will be captured in wholesale modelled base costs unless an explicit adjustment is made to exclude them. We are therefore considering how to treat atypical expenditure in the wholesale base cost models at PR24. More details will be provided in the draft methodology.</p>
Pre-modelling regional factor adjustments	We consider our approach to assessing wholesale modelled base costs at PR19 captured the key cost drivers. At PR24, we will therefore not consider applying pre-modelling adjustments to account for regional factors that may not be captured by the explanatory variables in the wholesale base cost models. Companies can submit cost adjustment claims for material exogenous factors not captured in the wholesale base cost models that lead to regional cost variations, which we discuss further in chapter 4.

²⁵ Ofwat, 'Our proposed approach to funding bioresources activities at PR24', December 2021.

²⁶ Ofwat, 'RAG 4.09 – Guideline for the table definitions in the annual performance report', February 2021.

3.2 Wholesale base cost modelling suite

At PR24, we propose to continue to use wholesale base cost models at different levels of cost aggregation to determine efficient cost allowances where feasible.

On one hand, disaggregated cost models can enable a wider range of cost drivers to be captured in the cost assessment approach relative to a more aggregated cost modelling approach. On the other hand, a more aggregated cost modelling approach allows for interactions and trade-offs between different services of the value chain to be captured. Developing wholesale base cost models at different levels of cost aggregation therefore accounts for these trade-offs. In response to our PR24 May consultation, companies agreed with the development of wholesale base cost models at different levels of cost aggregation.

The wholesale base cost modelling suite used to determine efficient wholesale base costs at PR19 is illustrated in the figure below.

Figure 3.1: PR19 wholesale base cost modelling suite

High degree of cost aggregation	Medium degree of cost aggregation	Disaggregated model
<ul style="list-style-type: none"> • Wholesale water (2 models): water resources + raw water distribution + water treatment + treated water distribution 	<ul style="list-style-type: none"> • Water resources plus (2 models): water resources + raw water distribution + water treatment • Bioresources plus (2 models): bioresources + sewage treatment 	<ul style="list-style-type: none"> • Treated water distribution (1 model) • Sewage collection (2 models) • Sewage treatment (2 models) • Bioresources (2 models)

For wholesale water, we do not expect material changes to the wholesale base cost modelling suite at PR24. We do not intend to revisit the development of disaggregated water resources, raw water distribution or water treatment at PR24 unless new evidence becomes available that would enable robust econometric models to be developed. One company in response to our PR24 May consultation suggested adding a second treated water distribution model to the modelling suite as it is the only level of cost aggregation with one model specification. Another company also said that the water resources plus models could be improved. We welcome proposals for alternative treated water distribution and water resources plus model specifications in response to this consultation.²⁷

For wholesale wastewater, we are consulting on an alternative approach to regulating bioresources at PR24, which would require bioresources allowed revenue to be determined

²⁷ We anticipate retaining the water resources control boundary as defined in PR19. See '[Water resources price control boundary decision letter](#)' for more details.

separately from other wastewater services. We consider setting a specific bioresources efficiency challenge would be more transparent and more likely to achieve a stretching, targeted efficiency challenge for bioresources activities.²⁸

For this reason, **the wholesale wastewater target cost modelling suite may need to change at PR24**. In particular, it may not be appropriate to model bioresources costs with other wholesale wastewater costs (eg sewage treatment) at PR24, which would rule out the use of bioresources plus (bioresources and sewage treatment) and wholesale wastewater models to determine efficient wholesale wastewater base cost allowances. **We therefore plan to reassess the feasibility of developing wastewater network plus wholesale base cost models at PR24** (ie sewage collection and sewage treatment), which would ensure that wastewater models at different levels of cost aggregation are used to set efficient cost allowances. We welcome proposals of potential wastewater network plus cost model specifications in response to this consultation.²⁹

The target PR24 wholesale base cost modelling suite is below. Where feasible, we will aim to adopt more than one model for each level of cost aggregation.

Figure 3.2: Target PR24 wholesale base cost modelling suite

High degree of cost aggregation	Medium degree of cost aggregation	Disaggregated cost model
<ul style="list-style-type: none"> • Wholesale water: water resources + raw water distribution + water treatment + treated water distribution 	<ul style="list-style-type: none"> • Water resources plus: water resources + raw water distribution + water treatment • Wastewater network plus: sewage collection + sewage treatment 	<ul style="list-style-type: none"> • Treated water distribution • Sewage collection • Sewage treatment • Bioresources

3.3 Wholesale base cost drivers and explanatory variables

The PR19 wholesale base cost drivers and corresponding explanatory variables provide a good starting point for PR24 as they are aligned with our cost assessment principles and were validated by the CMA at the PR19 redeterminations. But we are **open to considering additional or alternative cost drivers and explanatory variables at PR24**, as set out in our PR24 May consultation.

²⁸ Ofwat, '[Our proposed approach to funding bioresources activities at PR24](#)', December 2021.

²⁹ We did not use top-down wholesale wastewater models to determine efficient cost allowances at PR19. But two companies did suggest the development of top-down wholesale wastewater models at PR24 in response to our May consultation.

We identified four key categories of wholesale water and wastewater cost drivers to capture in the wholesale base cost models at PR19.³⁰

- **Scale** – to measure the size of the network and/or level of output.
- **Density** – to capture economies of scale at the treatment level and costs resulting from operating in highly dense/sparse areas.
- **Topography** – to capture energy requirements for transporting or pumping water or wastewater.
- **Complexity** – to capture the complexity of required treatment or the complexity of the network.

We tested a wide range of potential explanatory variables to proxy these cost drivers, and those that were included in the final model selection are set out below.³¹

Table 3.5: PR19 wholesale base cost selected explanatory variables

Cost driver	Wholesale water explanatory variables	Wholesale wastewater explanatory
Scale	Connected properties	Sewer length
	Length of mains	Load
		Sludge produced
Density	Weighted average density	Weighted average density
	Weighted average density squared	Weighted average density squared ³²
		Number of properties per sewer length
		Load treated in size bands 1-3
		Load treated in size band 6
		Sewage treatment works per property
Topography	Booster pumping stations per length of mains	Pumping capacity per sewer length
Complexity	Water treated at works of complexity levels 3 to 6	Load with ammonia consent below 3mg/l
	Weighted average treatment complexity	

We are open to considering alternative and/or additional cost drivers and explanatory variables at PR24 if the following conditions are met:

- they align with our cost assessment principles (eg clear engineering, operational and economic rationale and outside the control of the company in the short term);
- they would improve the performance of our wholesale base econometric cost models; and
- robust historical data is available or can be collected for all water companies back to 2011-12 on a consistent basis (between companies and over time).

³⁰ Explanatory variables to proxy differences in the level of activity undertaken by different water companies, and differences in the quality of service provided by different water companies, were also considered but not selected due to endogeneity concerns.

³¹ The full range of explanatory variables tested are included in CAWG, '[Cost assessment principles, scope of modelled base costs, and base cost drivers and explanatory variables](#)', 15 July 2021.

³² Included in CMA redetermination wholesale wastewater base cost models.

The most detailed proposals for additional and/or alternative wholesale base cost drivers and explanatory variables we have received so far in response to the PR24 May consultation and through the CAWG, 'Cost assessment principles, scope of modelled base costs, and base cost drivers and explanatory variables' 15 July 2021 are summarised below.

Average pumping head (APH) – topography explanatory variable

Provides an indication of economic and operational challenges companies face to pump water into, within, across and throughout the distribution system. APH was included in the PR14 econometric models, but not at PR19 due to concerns regarding data quality and statistical significance. We used booster pumping stations per length of mains instead.

Anglian Water, Thames Water and South Staffs Water have all asked that we reconsider the use of APH in the wholesale water base cost models at PR24, if the concerns identified at PR19 can be addressed.³³ We are currently in the process of assessing how APH reporting can be improved and will provide an update in the PR24 draft methodology.

Alternative size of sewage treatment works explanatory variable

At the November 2021 CAWG session, Anglian Water presented on an alternative disaggregation of the sewage treatment work explanatory variable.³⁴ It suggested disaggregating sewage treatment works (STWs) band 6 (serving population equivalent of more than 25,000) into five new bands, as shown in the table below. Anglian Water acknowledged that the proposed new bands are only an initial proposal for discussion.

Table 3.6 Anglian Water alternative breakdown of STWs band 6

Large works	Population equivalent
Size band 6 revised	25,000 – 125,000
Size band 7	125,000 – 250,000
Size band 8	250,000 – 500,000
Size band 9	500,000 – 1,000,000
Size band 10	>1,000,000

Anglian Water proposes using this information to replace the existing 'load treated in size band 6' variable with 'load treated in band 8 and above' to better account for economies of scale in sewage treatment. Data limitations were noted, given that the data required to produce the revised explanatory variable is not available for the years 2013-14 to 2015-16, which would need to be back-casted by companies. At the CAWG session, companies recognised this was an initial proposal and noted that any amendments to the variable

³³ Data issues related to the use of average pumping head were discussed in CAWG, [Average pumping head and other wholesale base cost data issues](#), 7 September 2021.

³⁴ CAWG, [Cost adjustment claims](#), 11 November 2021.

currently used in the model should be justified through engineering rationale and supported by robust evidence.

Regional wages and capital stock / price of capital

At the CAWG session ‘Cost assessment principles, scope of modelled base costs, and base cost drivers and explanatory variables’ 15 July 2021, Thames Water proposed the consideration of regional wages and capital stock / price of capital but did not receive strong support from other companies at the CAWG. It was generally considered that regional wage differentials would be better addressed through the cost adjustment claim process (if necessary), which we agree with. We also note that the CMA cautioned against the inclusion of a regional wage explanatory variable in Bristol Water’s PR14 redetermination because of counterintuitive results.³⁵ We also consider the inclusion of capital stock / price of capital in the wholesale base cost models would lead to multicollinearity with the existing scale cost drivers (eg network length). For these reasons, **we do not propose to consider these cost drivers any further at PR24** unless clear evidence is presented to demonstrate that the conditions outlined above are met.

The use of time trends as a proxy of technological change

At the July 2021 CAWG session, Thames Water also suggested using time trends as a proxy of technological change. At PR19 we considered including a time trend, but such variables did not have a stable or significant effect in the econometric cost models. We were also concerned that the time trend may interact with our separate frontier shift assumptions and as a result introduce unnecessary complexity. There may be further concerns if forecast costs are included in the cost models. For these reasons, our starting assumption is that time trends will not be included in our wholesale base cost models at PR24.

We welcome feedback on the cost driver and explanatory variable suggestions described above. We also invite detailed proposals for additional and/or alternative cost drivers and explanatory variables to consider at PR24 in response to this consultation if they meet the conditions outlined above. We ask respondents to provide details of whether data is available for the proposed explanatory variable that will proxy the cost driver in the wholesale base cost models. If data is not currently available, we request that respondents clearly define the detail of what data should be collected so that companies can provide the data through a future data request.

3.4 Sample period selection

In our PR24 May consultation we asked for views on whether there is more we could do to take into account **a forward-looking element into our assessment of wholesale base costs**.

³⁵ Competition and Markets Authority, ‘[Bristol Water plc. A reference under section 12\(3\)\(a\) of the Water Industry Act 1991. Report](#)’, October 2015, page 98.

In their responses, companies welcomed the introduction of a forward-looking element into our wholesale base cost assessment, but there were limited suggestions for how it could be implemented other than using the existing cost adjustment claim process.

Adjusting the model sample period is one potential alternative approach to ensuring the wholesale base cost models can accurately predict future efficient costs. Two companies suggested only using the most recent historical outturn data to estimate the econometric wholesale base cost models in response to the PR24 May consultation. We have also discussed the inclusion of business plan cost forecasts in the econometric wholesale base cost models at the CAWG, 'Forward looking capital maintenance assessment' 28 September 2021 workshop.³⁶

In this section we consider what sample period we should use to estimate the wholesale base cost models at PR24 and reflect on the comments and feedback received from companies.³⁷ We cover the following topics in the sub-sections below:

- historical time series; and
- use of PR24 business plan forecasts.

3.4.1 Historical time series

Our PR19 wholesale base cost models were estimated based on companies' actual expenditure over the period 2011-12 to 2018-19 (8 years of data). The historical time series available at PR24 should increase to 13 years of data (2011-12 to 2023-24).

A longer dataset is beneficial as it can improve the precision of model estimates. **Our working assumption for PR24 is therefore to utilise the full historical data series available to develop the wholesale base cost models.**

But we recognise that careful consideration should be taken to ensure that there are no structural breaks in the data that may mean use of the full data sample reduces rather than enhances the quality of the wholesale base cost models. A structural break occurs when there is an unexpected change over time in the estimated parameters of regression models, which could reduce the accuracy of model predictions. It could be caused by a change in cost allocation rules or more broadly a change in the activities or costs incurred by the water companies that cannot be explained by the model explanatory variables.

If a structural break is identified, potential remedies include:

- estimate models using a reduced / truncated historical sample period;

³⁶ CAWG, 'Forward looking capital maintenance assessment', 28 September 2021

³⁷ The discussion also applies to residential retail cost assessment.

- include a dummy variable in the models if the structural break represents a shift in the estimated constant rather than the estimated coefficients on the explanatory variables; or
- including an interaction term in the model if the structural break represents a change in the estimated coefficients on the explanatory variables (eg a dummy variable interacted with the affected explanatory variable).

We ask companies to consider the appropriate length of the historical time series in response to this consultation.

3.4.2 Use of PR24 business plan forecasts

There may be good reason to **consider including PR24 business plan forecasts in the wholesale base econometric cost models** if the historical period is not a good reflection of the future. The inclusion of forecast costs may also have the benefit of increasing the sample size (which may improve the precision of estimated model parameters) and incentivising companies to put forward stretching but feasible business plan proposals that may improve their efficiency ranking.

Ofgem used historical and forecast cost data to estimate their econometric total expenditure models at the most recent gas distribution price review (RIIO-GD2). The reason for this was to increase the size of the sample used in the regression analysis and to ensure that changes in technology and scope for future efficiency gains are explicitly taken into account.³⁸

We recognise, however, that there are risks associated with using business plan forecasts to estimate the wholesale base cost models, as highlighted by some companies at the CAWG, 'Forward looking capital maintenance assessment' 28 September 2021 workshop:

- **the inclusion of forecast data reduces the independence of the benchmarking process**, and may reduce the incentive on companies to reveal efficient costs, which may not be aligned with our cost assessment principles;
- **differences in business plan forecasts may reflect differences in risk appetite** between companies rather than differences in relative cost efficiency; and
- **there is limited evidence to demonstrate why the future is different to the past**. As discussed above, there will also be an increase in the historical time series available at PR24 compared to PR19. So, the case for including forecast costs in the wholesale base cost models may not be strong.

³⁸ Ofgem, 2020. RIIO-2 Final Determinations for Transmission and Gas Distribution network companies and the Electricity System Operator. Final Determinations: Technical Annex part one. RIIO-GD2 Step-by-Step Guide Annex. <https://www.ofgem.gov.uk/publications/riio-2-final-determinations-transmission-and-gas-distribution-network-companies-and-electricity-system-operator>

Overall, we are open but cautious about the possibility of including business plan forecasts into our wholesale econometric wholesale base cost models. We seek views from stakeholders on whether this is an option worth exploring at PR24.

3.5 Model estimation method

Different model estimation methods can be used to estimate econometric cost models.³⁹ The main estimation techniques that can be used when using panel data (ie data that contains observations for different companies across time) are summarised below.

Table 3.7: Model estimation techniques using panel data

Estimation method	Description
Pooled Ordinary Least Squares (OLS)	<ul style="list-style-type: none"> Standard OLS regression which treats each data point as a unique firm. Therefore, does not take account of the panel structure.
Random effects	<ul style="list-style-type: none"> Assumes each company has an unobserved unique time constant factor that affects costs, which is uncorrelated with other cost drivers.
Fixed effects	<ul style="list-style-type: none"> Assumes each company has an unobserved unique time constant factor that affects costs, which is correlated with other cost drivers.
Stochastic frontier analysis (SFA)	<ul style="list-style-type: none"> A modelling technique that explicitly accounts for the existence of inefficiency. It allows the residual term to split between inefficiency and error.

At PR19 we used random effects to estimate the wholesale base cost models, which explicitly takes into account the panel structure of the data and was supported by the CMA.⁴⁰ **We propose to maintain the use of random effects to estimate our wholesale econometric wholesale base cost models at PR24.**

We would only consider using OLS if the performance of models against relevant statistical tests (eg Breusch Pagan test) supported using ordinary least squares (OLS) instead.

We do not propose to use fixed effects estimation as it is data intensive (eg dummy variable for each company in the panel data set), which is likely to lead to imprecise model parameter estimates given the relatively small data set available. The CMA concluded this in the PR19 redeterminations, where it found most explanatory variables were not significant and the predictive power of the models dropped when using fixed effects.⁴¹ It can also be challenging to distinguish between inefficiency and company heterogeneity when using fixed effects.

³⁹ The discussion on model estimation method in this sub-section applies generally to econometric cost modelling.

⁴⁰ Competition and Markets Authority, '[Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations, final report](#)', March 2021, p. 123, paragraph 4.27.

⁴¹ Competition and Markets Authority, '[Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations, final report](#)', March 2021, pp. 122-123, paragraph 4.22.

We do not propose to use SFA to estimate the wholesale base cost models or to determine the catch-up efficiency challenge at PR24. We recognise that SFA has the advantage relative to random effects that it can separate companies' inefficiency from the random noise. But SFA inefficiency estimates are very sensitive to the assumptions made on the distribution of the model error term. We therefore propose not to use SFA because of the additional uncertainty it creates in relation to the appropriate way of modelling inefficiency. The CMA came to the same conclusion in the PR19 redeterminations.⁴²

3.6 Model selection process

The wholesale base cost models that are used to determine efficient wholesale base costs should be able to accurately predict and forecast efficient costs, and remain robust to scrutiny.⁴³

Econometric cost models should be underpinned by clear engineering, operational and economic logic, as set out in section 2.1. This is a necessary but not sufficient condition when assessing model robustness. In line with our approach to econometric model selection at PR19, we should also:

- ensure the estimated coefficients are of the right sign and of plausible magnitude;
- evaluate the statistical validity of the model across a range of statistical diagnostic tests (eg statistical significance of individual parameters, RESET test for omitted non-linearities, multicollinearity test, etc.);
- assess if the estimated model results are stable / robust to changes in the underlying assumptions and data (eg different sample period; alternative model specification); and
- assess the predictive power of the model (eg R-squared; can the econometric cost models accurately forecast the efficient expenditure of companies going forward).

We recognise that any one econometric model may not pass all model robustness tests and setting such a high standard may make it impossible to develop any econometric cost models for PR24. This would not be a desirable outcome given the importance of econometric cost models in reducing information asymmetry between ourselves and the water companies.

We will therefore consider the relevant importance of each test result when developing and selecting econometric models. For example, it may be appropriate to include variables that are marginally statistically significant if they produce intuitive results that reflect engineering, operational and/or economic logic. We must also ensure that explanatory variables that are statistically significant are underpinned by clear engineering, operational

⁴² Competition and Markets Authority, '[Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations, final report](#)', March 2021, p. 123, paragraph 4.26.

⁴³ The discussion on the model selection process in this sub-section applies generally to econometric cost modelling.

and/or economic logic. We will ensure transparency by clearly explaining the reasoning behind the wholesale econometric models selected.

Our PR19 wholesale base cost models went through a rigorous model selection process and were supported by the CMA. We therefore propose to follow the same approach at PR24.

3.7 Consultation questions

Approach to wholesale base cost modelling at PR24

Scope of wholesale modelled base costs

3. Do you consider the scope of wholesale modelled base costs should be amended at PR24? If so, please explain how the potential amendment/s to wholesale modelled base costs can be justified based on our proposed assessment framework.
4. Would you recommend collecting additional data in relation to growth expenditure (cost and/or cost driver data) to improve cost assessment at PR24? If so, what additional data would you recommend collecting? Please provide definitions alongside suggested data additions.

Sample period selection

5. Do you agree that we should utilise the full historical data series available to develop the wholesale base cost models at PR24 (from 2011-12 onwards) unless there is clear justification for using a reduced time series (eg structural break that cannot be addressed through other remedies)?
6. Should we consider including business plan forecasts in our wholesale base cost models at PR24?

Target modelling suite

7. Do you agree with our proposed target wholesale base cost modelling suite at PR24?
8. Do you consider it would be worthwhile attempting to develop wholesale wastewater network plus models for PR24? If so, do you propose any potential wastewater network plus cost model specifications to consider?

Cost drivers and explanatory variables

9. Do you think we should reconsider the inclusion of APH in the wholesale water base cost models at PR24? If so, should it be a substitute for, or additional to, booster pumping stations per length of mains?

10. Should we consider replacing the existing 'load treated in size band 6' variable with 'load treated in band 8 and above' in the relevant wholesale wastewater base cost models?
11. Please provide detailed proposals for any additional / alternative cost drivers and explanatory variables we should consider at PR24, including clearly defined data requirements that would need to be collected from companies.

Model estimation method

12. Do you agree that we should maintain the use of random effects to estimate our wholesale base cost models at PR24?

Model selection process

13. Do you agree with our proposed model selection process?

4. Cost adjustment claims

Cost adjustment claims: summary

- At PR24, we will retain the use of a cost adjustment claim process, with materiality thresholds and a gated assessment.
- We propose that the cost claim process should be separated between base and enhancement cost adjustment claims, with enhancement claims clearly allocated to the associated enhancement expenditure line in companies' business plan submissions.
- We consider that base cost adjustment claims should be symmetrical by default. We would expect a company to indicate in its cost adjustment claim submission how an upward adjustment to its base cost allowance would impact on base cost allowances for other companies.
- We invite companies to indicate in their response what cost adjustment claims they would consider submitting at PR24 assuming the PR19 base cost models were used, and outline what additional industry data would need be collected to facilitate the development of high-quality claims.
- Where a new cost adjustment claim is submitted that was either rejected or not submitted at PR19, we will expect evidence of a material change in the company's circumstances or in the evidence available since PR19, unless it is driven by a change in the scope or in the cost drivers of the base models used at PR24.
- We will consider whether to take into account the quality of cost adjustment claims as part of our assessment of PR24 business plans.
- We will consider providing additional guidance on the estimation of the implicit allowance.
- We invite views on whether an early cost adjustment claim submission would be welcome at PR24.

For PR24, we will retain the use of a cost adjustment claim process, with materiality thresholds and a gated assessment, to complement our econometric analysis.

Econometric cost modelling is our main benchmarking tool used to determine efficient base costs (wholesale and residential retail). But we recognise that econometric models cannot account for all relevant factors that affect costs, and there may be instances where a post-modelling cost adjustment is required. Cost adjustment claims therefore allow a company to present evidence in its business plan of unique operating circumstances, legal requirements or atypical expenditure which drive higher efficient base costs for the company relative to its peers.

By its nature, the cost adjustment claim process should be symmetrical. Our cost models are just as likely to overstate a company's efficient cost allowance as they are to understate it. In

both cases, an adjustment may be appropriate. However, companies have an incentive to make cost adjustment claims where our models are likely to understate their expenditure requirements, but not where our models are likely to overstate their expenditure requirements. If the process is one-sided, customers may not be adequately protected in cases where the models overestimate companies' expenditure requirements.

To ensure that customers are protected, at PR19 we set a high evidential bar for accepting cost adjustment claims. We set higher materiality thresholds that claims needed to meet before being assessed than those used at PR14, to ensure that the cost claim process focused on the most material areas of adjustments to our models. We also set out a gated process to assess cost adjustment claims, setting out the relevant evidence we expected companies to submit in support of their claims.⁴⁴

As set out in our PR24 May consultation, we will maintain a high evidential bar but will seek to improve the cost adjustment claim process at PR24. We aim to improve the clarity of cost adjustment claim guidance to facilitate the development of well-evidenced claims and to reduce the number of poorly evidenced claims. We also aim to increase the availability of cross-sector data to enable well-evidenced cost adjustment claims to be developed, and to facilitate the application of symmetrical cost adjustments more widely.

We discuss our thinking in more detail in the sections below, reflecting on feedback received from companies in response to our PR24 May consultation and at the CAWG.

4.1 Scope of the cost adjustment process

At PR19, companies submitted cases for adjustments to our base (wholesale and residential retail) and enhancement cost allowances.

We propose that at PR24 **the cost adjustment claim process should be separated between base and enhancement costs**. At PR19, enhancement cost adjustment claims often required reallocation to the relevant enhancement area the claim related to. At PR24, we will retain an adjustment process for enhancement expenditure, and expect that enhancement claims to be clearly allocated to the associated enhancement line in companies' business plan submissions. We consider this will improve transparency, minimise the need for post-submission reallocations and help to ensure a more coherent cost assessment approach. This may also allow for opportunities to tailor the gated process to base cost claims, as we discuss in section 4.4 below. We will provide more details of our approach to assessing enhancement costs in our PR24 draft methodology.

⁴⁴ Ofwat, '[Delivering Water 2020: Our final methodology for the 2019 price review. Appendix 11: Securing cost efficiency](#)', December 2017, pp. 14-15.

4.2 Symmetrical process

By its nature, **the cost adjustment process should be symmetrical** (ie a positive adjustment for a company should be offset by downwards adjustments to other companies). Our cost models are just as likely to overstate a company's efficient cost allowance as they are to understate it.

Companies have an incentive to reveal information where our cost models lead to an underestimation of their allowance, but not where our models may lead to an overestimation of their costs. This may lead to customers not being adequately protected from instances where our econometric models are overestimating a company's allowance.

At both PR14 and PR19 the adjustment process was generally one-sided. During the PR19 process, **we received over 60 cost adjustment claims, for a total of over £4 billion of expenditure in addition to our cost baselines**. No company submitted a case for a negative adjustment to its allowance.

The only two-way adjustment we implemented at PR19 was the growth unit cost adjustment. However, this adjustment was not fully symmetrical as we took a conservative approach and applied a 50% cut to the negative adjustment, thereby making it asymmetric. In its final determination to the PR19 appeals, the CMA supported our approach to the growth adjustment and applied a stronger challenge to the disputing companies by making the adjustment symmetrical (ie the CMA applied a 100% downward adjustment).⁴⁵

The figures below summarise the key areas where we received base cost adjustment claims from companies at PR19.

Figure 4.1: Base cost adjustment claims at PR19

Wholesale base costs	Residential retail
<ul style="list-style-type: none"> • Population density • Economies of scale • Treatment complexity • Maintenance • Regional wages • Energy requirements • Sludge transport and disposal 	<ul style="list-style-type: none"> • Average bill size • Deprivation • Transience

We consider **most of the factors relating to PR19 base cost adjustment claims (see Figure 4.1 above) are not 'unique' to a particular company (eg do not relate to one-off atypical expenditure), but rather relate to 'persistent' regional circumstances**. Where the costs are persistent and have been incurred in the past, our modelled cost baselines, which are based

⁴⁵ Competition and Markets Authority, '[Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations – Final report](#)', March 2021, p. 303, paragraph 4.780.

on historical data, will be affected for all companies even if the underlying cost driver is not captured in the models. This will lead to some companies receiving a cost allowance that is too high, and other companies receiving a cost allowance that is too low. These claims would therefore lend themselves well to symmetrical cost adjustments across the sector.

For example, labour costs are incurred by all companies and are included in our efficient cost allowances. Consequently, if an adjustment was deemed appropriate for regional wages, a positive cost adjustment for a company operating in a region with relatively high wages should be matched with negative cost adjustments for companies operating in regions with relatively low wages.

We therefore consider that **base cost claims at PR24 should be symmetrical by default**. The need for cost adjustment claims to be symmetrical was clearly set out in our PR19 final methodology, and we consider that symmetrical adjustments should be implemented more systematically at PR24 to protect customers from the risk of a one-sided cost adjustment claim process.

We would expect a company to **indicate in its cost adjustment claim submission how an upward adjustment to its base cost allowance would impact on cost allowances for other companies**. We consider that the lack of such evidence would likely lead to our rejection of the cost adjustment claim. Where the company considers the claim to be an exception to the symmetry principle, it should clearly demonstrate why this is the case.

To enable this evidence to be produced, it will be key to consider requirements for additional data collection across the sector early in the process. We discuss the need for improved data availability in the section below.

4.3 Cross-sector data requirements

The availability of cross-sector data in areas where companies are looking to submit cost adjustment claims will be key to producing robust and high-quality claims at PR24. We are therefore open to collecting additional cross-sector data ahead of the PR24 business plan submissions if it will assist companies in developing high-quality cost adjustment claims. But we recognise that any additional data collection should be focused to avoid disproportionate burden on companies.

In response to this consultation, we invite companies to:

- indicate which base cost adjustment claims (wholesale and residential retail) they would consider submitting at PR24 assuming the PR19 cost models are used to assess efficient base costs; and

- outline what additional cross-sector data would need to be collected from companies to support the submission of well-evidenced cost adjustment claims, including any proposed data definitions.

The unavailability of cross-sector data may hinder the company's ability to produce a robust and high-quality cost adjustment claim and would likely lead to the rejection of the cost adjustment claim.

4.4 Standard of evidence

At PR19, we set a high evidential bar for allowing adjustments, including the use of materiality thresholds and a gated assessment. The assessment gates used were:

- need for investment;
- need for adjustment;
- robustness and efficiency of the cost;
- management control;
- best option for customers;
- customer protection;
- affordability; and
- board assurance.

At PR24, **we will retain the use of materiality thresholds and the gated assessment to assess cost adjustment claims**. We consider that materiality thresholds help to mitigate the risks posed by asymmetry of information and to proportionately focus our assessment on the most significant cost adjustments.

We expect robust and high-quality evidence to be submitted against the relevant gates. For base cost adjustment claims, the **most important gate is the need for adjustment**. We expect companies to clearly explain why our benchmarking analysis does not adequately capture their circumstances, as well as presenting quantitative evidence of how an adjustment would impact efficient wholesale base cost allowances for themselves and the rest of the industry. Where this gate is failed, we will reject the cost claim.

Companies must also clearly demonstrate that the proposed cost adjustment reflects efficient costs and is driven by factors that are outside of company control. The other assessment gates may be less relevant from the perspective of a base cost adjustment claim. We therefore consider there may be **scope for rationalising the assessment gates used for base cost adjustment claims at PR24**, compared to the gates used to assess enhancement adjustments.

Where a new cost adjustment claim is submitted that was either rejected or not submitted at PR19, **we will expect evidence of a material change in the company's circumstances or in**

the evidence available since PR19, unless it is driven by a change in the scope or in the cost drivers used at PR24. In the absence of such evidence, we will likely reject the cost adjustment claim.

It is important that companies are incentivised to submit robust and high-quality cost adjustment claims. At PR19, the quality of cost adjustment claims fed into the scoring of companies' business plans at the initial assessment of plans. **We will consider whether to take into account the quality of cost adjustment claims as part of our assessment of PR24 business plans.** Knowledge of the PR19 base cost econometric models should better place companies to identify what exogenous cost drivers are unlikely to be captured in our cost models and may warrant a separate adjustment. This should improve the quality of cost adjustment claims submitted at PR24.

4.5 Implicit allowance

The implicit allowance relates to the proportion of the claim which is already covered by the base cost allowance (wholesale and residential retail). For example, regional labour costs are included in our base cost models, and the models will therefore be providing an allowance for this. Any cost claims on regional labour would need to account for the allowance already included in the base cost models.

It is important that companies calculate an implicit allowance when submitting their cost adjustment claims to avoid the double counting of allowances. If costs related to the claim have been incurred historically and are captured in the econometric cost models, then the **implicit allowance will always be greater than zero.**

The calculation of an implicit allowance is therefore a necessary condition to pass the need for adjustment assessment gate. We expect companies to clearly set out the value of the cost adjustment claim before and after the deduction of the implicit allowance (ie 'gross' versus 'net' value), as well as details of the approach(es) taken to estimate the implicit allowance. The company should also **demonstrate that the claim remains material after deducting the implicit allowance.** In the absence of such evidence, the need for adjustment would likely fail despite the calculation of an implicit allowance.

Implicit allowances can be estimated using various approaches, and there is no single correct approach. Certain approaches may be more appropriate than others depending on the claim, and it may also be appropriate to consider a range of approaches to come to an estimate of the implicit allowance. Approaches considered at PR19 (particularly in relation to wholesale base costs) included the inclusion/removal of an explanatory variable from the models, the removal of the relevant expenditure from the models, and through the assessment of average industry unit costs related to the claim. This is not an exhaustive list of potential approaches, and we welcome suggestions of other potential approaches to estimating the implicit allowance at PR24.

We will provide further guidance on the estimation of implicit allowances in the PR24 methodology, with the aim of improving transparency and clarity where possible. For example, whether implicit allowances should be estimated before or after the application of the catch-up efficiency challenge. We will also consider improving the cost adjustment claim Excel template to improve consistency and comparability between claims.

It is important to note that, while the estimation of an implicit allowance is a necessary condition to pass the need for adjustment, **we do not consider it is a sufficient condition to pass the need for adjustment gate**. We would expect the company to present compelling evidence to justify why an adjustment is needed, such as:

- clearly setting out why it has unique and atypical circumstances not captured by the econometric model cost drivers;
- if an alternative explanatory variable is used to calculate the cost adjustment claim, we would expect the company to clearly explain the engineering, operational and/or economic rationale for its selection, and explain why it is superior to the explanatory variables in the base cost models; and
- demonstrate that the modelled cost allowance would be insufficient to accommodate the special factor without the claim.

We will consider whether a separate assessment gate for the implicit allowance, distinct from the need for adjustment gate, would help to improve clarity of the cost adjustment claim process.

4.6 Early cost adjustment claim submission

At PR19, companies were invited to provide an early submission of cost adjustment claims (May 2018). The purpose of the submission was to provide us with early sight of companies' claims, to allow us to reach decisions on the claims by the initial assessment of plans, and to provide companies with early indicative feedback on the quality of the claims. Companies indicated the early feedback was generally helpful to refine the claims that were later submitted in business plans. **We invite views on whether an early cost adjustment claim submission would also be welcome at PR24.**

4.7 Consultation questions

Cost adjustment claims

14. Do you agree that the cost adjustment claim process at PR24 should be separated between base (wholesale and residential retail) and enhancement claims?
15. What base cost adjustment claims (wholesale and residential retail) would you consider submitting if the PR19 base cost models were used to assess efficient costs at PR24?

16. What additional cross-sector data should be collected to support the submission of the claims indicated in response to the previous question? Please describe and explain the rationale behind the additional data that you consider should be collected and provide a draft definition.
17. How can the cost adjustment claim guidance be enhanced to improve the quality of cost adjustment claim submissions?
18. Would an early cost adjustment claim submission be welcome at PR24?

5. Capital maintenance and asset health

Capital maintenance and asset health: summary

- At PR19, capital maintenance expenditure was included in our wholesale base cost econometric models, which were estimated using historical data. We used forecasts of cost drivers to account for future changes in the asset base.
- The CMA considered that our PR19 approach provided adequate funding for capital maintenance costs. But the CMA also suggested that we consider developing forward-looking indicators that would enable us to enhance our assessment of capital maintenance expenditure with a forward-looking element
- Companies have found it challenging to provide evidence to demonstrate why forward-looking costs may be different from those incurred in the past
- We propose to build on, rather than replace, our PR19 approach to assessing capital maintenance at PR24, and seek feedback on the following modelling options:
 - include forecast costs in the wholesale base cost econometric models;
 - set a forward-looking catch-up efficiency challenge; and
 - amend wholesale base cost explanatory variables.
- The current asset health performance commitments show an improving trend in performance, although several companies did not meet their performance commitment levels in 2020–21. We are interested in exploring a wider range of asset health measures to enable us to form a holistic and more complete view of the state of asset health in the sector.
- We intend to use the additional asset health measures as:
 - Information to inform PR24 wholesale base cost assessment – to help ensure that our independent estimate of efficient wholesale base costs is sufficient to meet future capital maintenance requirements.
 - Information that can be used to monitor asset health over time – help to hold companies to account in this area and enable more accurate asset health comparisons between companies and over the long term.
 - Incentives for long term resilience – monitoring of greater amounts of comparable asset health information may help to strengthen incentives for long term resilience and reinforce the long term focus.
- We have collated a long list of potential asset health measures from a variety of information sources that may help to provide a more complete picture of asset health. We seek feedback on the asset health measures, and welcome suggestions for other measures not included in our list.

This chapter focuses on how we could improve our approach to assessing capital maintenance expenditure at PR24, with a focus on incorporating more of a ‘forward look’ into our assessment of wholesale base costs at PR24. We approach this by considering additional methods and information that can be used to ensure that our independent estimate of efficient wholesale base costs is sufficient to meet long term capital maintenance requirements.

At PR19, capital maintenance expenditure was assessed as part of wholesale modelled base costs rather than through a separate capital maintenance assessment. Determining our wholesale base cost allowance through this approach provides a better comparison for companies that follow different investment strategies. For example, by delivering efficiencies through flexing and adapting the blend of operating and capital solutions.

Our econometric models used forecasts of cost drivers to account for future changes in the asset base, and we set an efficient allowance for the long term based on a long time series of historical cost data. We consider that companies with a large, diverse asset base should be able to balance peaks, troughs and atypical lumps in investment on particular cohorts of assets within a long term average allowance. A company could raise cost adjustment claims if it considered that our models did not reflect its individual circumstances, including where it believed its historical costs were not reflective of its future needs.

At the PR19 redeterminations, the CMA considered that our approach to assessing capital maintenance expenditure provided adequate funding for capital maintenance costs.⁴⁶ The CMA recognised that some companies may be in peaks and troughs in individual periods but concluded that there should be no systematic underfunding in the long run.

The CMA also acknowledged that our cost assessment is mostly backwards looking and that potential issues with capital maintenance may be forward looking. It therefore suggested that we consider developing indicators to track this issue and to enable us to enhance our analysis with a forward-looking element that will assist in triangulating results from econometric modelling of historic costs.

We subsequently highlighted this as a topic of interest in our PR24 May consultation ‘[Creating tomorrow, together](#)’, and have discussed at two CAWG meetings how we could incorporate a forward-looking aspect into our cost assessment approach, while ensuring that customers do not pay twice for capital maintenance.⁴⁷ We also explored the collection of additional data to better monitor asset health over time and help to justify current and future levels of efficient capital maintenance expenditure.

⁴⁶ Competition and Markets Authority, ‘[Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determination, final report](#)’, March 2021, pp. 181-185, paragraphs 4.280-4.293.

⁴⁷ CAWG, ‘[How do we reflect future maintenance needs in cost assessment](#)’, 26 May 2021; and CAWG, ‘[Forward looking capital maintenance assessment](#)’, 28 September 2021.

The sections below reflect on this discussion and set out our current thinking on how we could incorporate more of a 'forward look' into our cost assessment approach. We also outline candidates for additional asset health measures based on a review of available data sources including information provided as part of the asset management maturity assessment (AMMA). We seek feedback on the options proposed so that we can make further progress in this area ahead of the PR24 draft methodology.

5.1 Defining the problem

In response to our May consultation and at the CAWG, 'Forward looking capital maintenance assessment' 28 September 2021, water companies welcomed the introduction of a forward-looking element into our cost assessment approach as they consider the historical period is not a good reflection of the future.⁴⁸

But companies have found it challenging to articulate or provide evidence to demonstrate why forward-looking costs may be different from those incurred in the past. The explicit examples received through the CAWG workshop are:

- **shorter asset lives** (eg increased use of loggers and meters, which have shorter asset lives than traditional water and wastewater assets);
- **the move to net zero and broader climate change impacts** placing new challenges on assets; and
- **increased complexity of sewage treatment** due the Water Industry National Environment Programme (WINEP) / National Environment Programme (NEP) programme for phosphorus removal.

In addition, the evidence we have received to demonstrate the impact of the examples above on future capital maintenance requirements has been very limited, which makes it challenging to assess the materiality of the issues. For example:

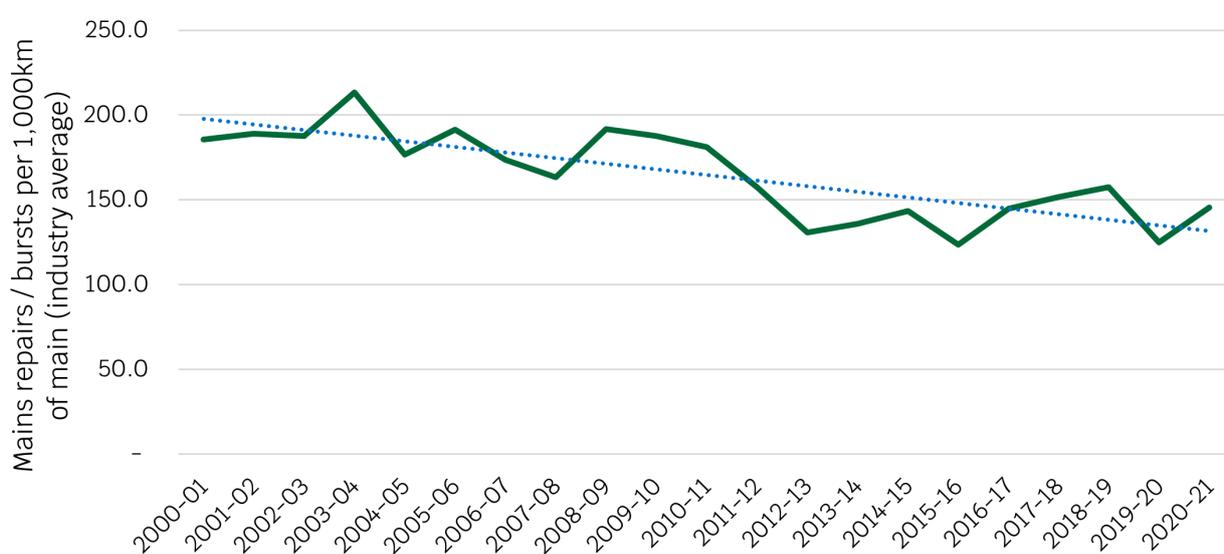
- **Companies have always managed assets with a range of asset lives** and companies have not presented any evidence that asset lives have reduced at the macro level (eg trend in the weighted average asset life across all assets). We also need to be cautious given that the asset mix is largely within company control, which **risks introducing endogeneity** into our cost assessment approach if decisions are made based on different asset lives faced by individual companies.
- **It is also not clear how the move to net zero and broader climate change impacts will affect capital maintenance requirements.** We have not yet been presented any evidence to demonstrate that a step change in capital maintenance expenditure is required to address these challenges. In addition, companies have been delivering reductions in

⁴⁸ CAWG, '[Forward looking capital maintenance assessment](#)', 28 September 2021.

carbon emissions through wholesale base expenditure to date, so it is not clear why the historical period is not a good reflection of the future.

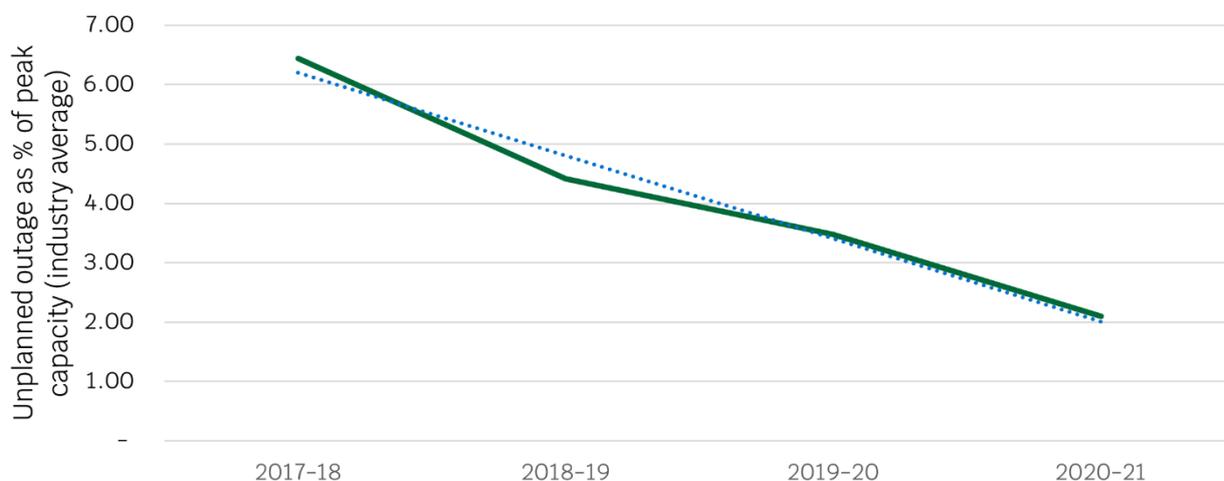
The lack of evidence provided by companies to illustrate the issue is compounded by the evidence available to us. The figures below show the trend in industry average performance across the three common asset health performance commitments at PR19 – mains repairs, unplanned outage and sewer collapses.⁴⁹ All three asset health measures suggest that performance is on an improving trend, although several companies did not meet their performance commitment levels in 2020-21.

Figure 5.1: mains repairs / bursts per 1,000km of main – industry average



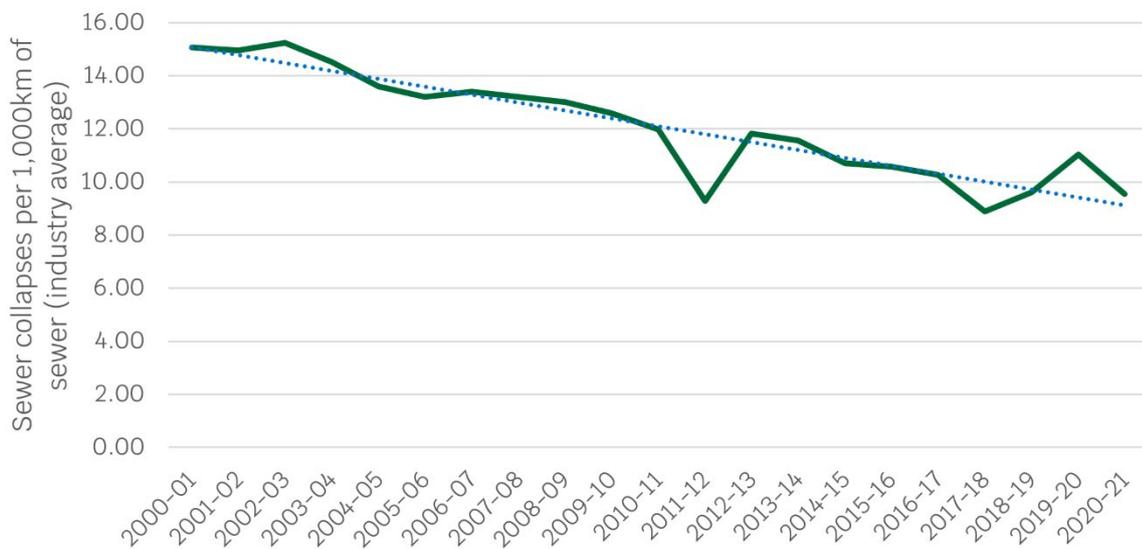
Source: Ofwat analysis of company annual submissions

Figure 5.2: unplanned outage as % of peak capacity – industry average



Source: Ofwat analysis of company annual submissions

⁴⁹ We note that long term trends may be somewhat affected by changes in reported definitions over time.

Figure 5.3: sewer collapses per 1,000km of sewer (industry average)

Source: Ofwat analysis of company annual submissions

Treatment works compliance is also considered a common asset health performance commitment, but it has a performance commitment level of 100% to reflect statutory requirements to comply with discharge permits. However, we use the performance commitment deadband of 99% as the target for this assessment to allow for some fluctuation in performance within which companies do not incur underperformance. Treatment works compliance data also suggests that performance is on an improving trend.

Companies have highlighted during the CAWG, 'How do we reflect future maintenance needs in cost assessment?' 26 May 2021 that water main replacement rates have decreased over time.⁵⁰ We have explored whether this is an issue that needs to be addressed in our approach to assessing wholesale base costs at PR24. Overall, the evidence available to us does not suggest that this is an issue that requires us to amend our cost assessment approach. In summary:

- While water main replacement rates have decreased in recent years, this is the result of several factors, including:
 - historical investment improving the asset stock - over 40 percent of water mains are less than 30 years old⁵¹ and are expected to be in service for over 160 years⁵² as most of these mains will be high or medium density polyethylene which will not corrode;
 - a reduction in renewals driven by discolouration (which was reflected in historical renewal rates); and

⁵⁰ CAWG, '[How do we reflect future capital maintenance needs in cost assessment?](#)', 26 May 2021, see slides presented by Wessex Water

⁵¹ This relates to a 13% increase in the length of water main, and 31% of water mains have been renewed or relined, since 1990. So simplistically, ≈44% of water mains are less than 30 years old.

⁵² UK Water Industry Research, '[Long-term aging of polyethylene pipes](#)', September 2020.

- improved understanding of mains condition and technological developments such as pressure management.
- The decrease in water mains replacement rates is not the result of our cost assessment approach leading to reduced investment levels. Wholesale base expenditure has continued to increase over time despite reducing water mains renewals rates. This suggests that companies have followed alternative strategies to maintain the health of water mains, which has been enabled by technological developments.
- Since the reduction of mains renewal rates, companies have continued to improve performance on asset health common performance commitments (see figures above). This supports the view that alternative strategies (ie other than mains renewals) have substituted, at least partially, previous approaches.

But we are aware that the existing asset health measures we collect may not provide a full picture and are interested in exploring a wider range of asset health measures to enable us to form a holistic and more complete view of the state of asset health in the sector.⁵³

Overall, we consider that it is best to build on, rather than replace, our PR19 approach to assessing capital maintenance at PR24, based on the suggestions presented by companies and the assessment from the CMA. We will continue to consider how best to incorporate more of a ‘forward look’ into our assessment of capital maintenance expenditure at PR24, as well as the collection of a wider range of asset health measures to ensure that allowances continue to be sufficient, and companies are taking appropriate action to ensure asset health does not deteriorate.

We introduce potential approaches that may allow more of a ‘forward look’ to be incorporated into our approach to assessing wholesale base costs and candidates for additional asset health measures below.

5.2 Potential modelling approaches

We outlined several potential modelling approaches at the CAWG ‘Forward looking capital maintenance assessment’ 28 September 2021 that would allow a forward-looking element to be incorporated into our approach to assessing wholesale base costs, some of which were suggested by companies in response to our May consultation:⁵⁴

- Include forecast costs in the wholesale base cost econometric models.
- Set a forward-looking catch-up efficiency challenge.
- Amend wholesale base cost explanatory variables.

⁵³ This is important given that companies are more likely to reveal factors that they consider lead to higher costs than factors that lead to lower costs.

⁵⁴ CAWG, [‘Forward looking capital maintenance assessment’](#), 28 September 2021.

- Separate capital maintenance modelling.

These options are set out below and we welcome views on whether they should be explored further, and suggestions of other options we could consider.

5.2.1 Include forecast costs in the wholesale base econometric models

We have relied on historical cost data to produce an independent forecast of efficient wholesale base costs at previous price controls. But there may be an argument for including business plan forecasts in the wholesale base cost econometric models at PR24 if we consider the historical period may not be a good reflection of the future and if business plan forecasts reflect future efficient costs. We set out the benefits and risks of this option in more detail in Chapter 3 above.

5.2.2 Set a forward-looking catch-up efficiency challenge

At PR19, we set the catch-up efficiency challenge on a backwards-looking basis. This means we assessed the relative efficiency of each company based on historical outturn costs only.

We are open to the option of setting a forward-looking catch-up efficiency challenge at PR24. This would involve comparing model predicted costs (ie output of the wholesale base cost econometric models) with business plan forecast costs. This would ensure that any changes between the historical and forecast period are taken into account within our cost assessment approach. This may be because of a forecast increase in wholesale base activity levels across the industry (ie a relatively lower catch-up efficiency challenge) or because of a greater scope for future efficiency gains (ie a relatively higher catch-up efficiency challenge). This option could be considered whether business plan forecasts are included or excluded from econometric model estimation.

We applied a 50% weight to the forward-looking residential retail catch-up efficiency challenge at PR19, and Ofgem set a forward-looking catch-up efficiency challenge at RIIO-GD2 which the CMA did not find error with.^{55, 56}

5.2.3 Wholesale base cost explanatory variables

We include explanatory variables in the wholesale base cost models to explain variations in efficient wholesale base costs between companies and over time.

⁵⁵ Ofwat, '[PR19 final determinations: Securing cost efficiency technical appendix](#)', December 2019.

⁵⁶ Competition and Markets Authority, '[Energy Licence Modification Appeals](#)', March 2021.

Some companies suggested adding additional explanatory variables into the wholesale base models to capture differences in capital maintenance activity between companies and over time (eg length of mains refurbished and relined, network age variables, etc.) in response to our May consultation and at the CAWG, 'How do we reflect future maintenance needs in cost assessment?' 26 May 2021.⁵⁷

We propose not to include capital maintenance activity related variables in the wholesale base cost models at PR24. We reached this position because of concerns regarding:

- **endogeneity and perverse incentives** – these are factors that can be influenced by water companies in the short run and may therefore lead to perverse incentives (eg replacing more or less water mains than is optimal to do so);
- **double funding** – there is a risk that the inclusion of activity-based variables leads to companies receiving cost allowances to deliver outputs they should have delivered with previous efficient cost allowances; and
- **inconsistency with the totex regulatory framework** – the totex framework encourages companies to deliver outcomes using an optimal mix of opex and capex solutions. The inclusion of activity-based variables may therefore introduce capex bias.

We also raised these concerns when developing the PR19 wholesale base cost models, and decided that they outweighed the potential benefits of capturing the variable in the cost models.⁵⁸ A view that was also shared by the CMA.⁵⁹

However, **we are open to considering adjusting existing wholesale base cost explanatory variables where circumstances have changed or new data has become available since the development of the PR19 wholesale base cost models.** For example, an alternative explanatory variable that may better capture the impact of sewage treatment complexity on efficient capital maintenance costs compared to the existing sewage treatment variable (percentage of load with ammonia consent below 3mg/l).

5.2.4 Separate capital maintenance modelling

Some companies have suggested that we develop separate capital maintenance econometric models, to consider alongside our wholesale base cost econometric mode. **We do not**

⁵⁷ CAWG, '[How do we reflect future capital maintenance needs in cost assessment?](#)', 26 May 2021, see slides presented by Wessex Water.

⁵⁸ Ofwat, '[Supplementary technical appendix: Econometric approach](#)', January 2019, p. 16.

⁵⁹ Competition and Markets Authority. '[Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations. Final report](#)', March 2021, p. 132.

consider separate capital maintenance modelling is an option worth considering at PR24 as it would not be in line with our totex regulatory framework (ie it may cause capex bias).⁶⁰

5.3 Potential asset health measures

As we outlined in section 5.1, the evidence currently available to us does not demonstrate a material asset health problem that needs addressing. In particular, data on the common asset health performance commitments (mains repairs, unplanned outage, sewer collapses, and treatment compliance) suggests an improving trend over time. But at the same time, companies have argued that the historical period is not a good reflection of the future, and that we need to introduce more of a 'forward-look' into our approach to assessing wholesale base costs.

We are therefore keen to explore additional asset health measures that may help to provide insight into levels of asset health at a sector level and to inform our cost assessment approach at PR24. At the CAWG 'Forward looking capital maintenance assessment' 28 September 2021, companies also recognised the need for better and more consistent information on asset health and resilience to demonstrate effective asset stewardship.

The box below introduces the asset management maturity assessment (AMMA), which has enabled the sector to develop a better understanding of how different companies manage asset health and operational resilience. It has also helped us to identify potential additional asset health measures discussed in this paper.

⁶⁰ The development of capital maintenance models is also made challenging because of the abolition of renewals accounting in 2015-16, which led to a higher proportion of costs being recorded as opex instead of capital maintenance from then on (ie structural break). Source: <https://www.ofwat.gov.uk/wp-content/uploads/2017/04/RAG-1.08-Principles-and-guidelines-for-regulatory-reporting-under-the-new-UK-GAAP-regime.pdf>

Introduction to AMMA

The effective management of assets is vital in delivering sector-wide operational resilience. Securing resilient water and wastewater services is a key aspect of our strategic goals to transform companies' performance and make sure they can meet the long-term challenges the sector faces. We expect companies to understand the risks to customers and the environment from asset failure and to demonstrate they are effectively managing their assets.

As part of this we expect companies to collect, monitor and analyse sufficient information to demonstrate that they are being effective stewards of their assets by planning and investing in them appropriately. It is also important to protect customers from paying again for benefits they should already have received from capital maintenance investment in previous price reviews.

Through the completion of a co-created asset management maturity assessment (AMMA) the sector has developed a better understanding of the processes, teams and technologies within companies for managing asset health and operational resilience.⁶¹ Through the AMMA we made a number of recommendations for companies to take forward, including to develop and report on a comprehensive suite of leading and lagging asset health measures to monitor asset health risks and trends, as well as the long-term effectiveness of their asset management plans.⁶² Leading measures are used to predict trends and lagging measures are used to measure past performance. We also said we should consider doing more to monitor companies' asset health and operational resilience.

In the following sub-sections, we:

- propose how we could use additional asset health measures;
- outline the criteria that could be used to assess the suitability of potential asset health measures; and
- provide a long list of potential additional asset health measures, which is not intended to be exhaustive but is intended to form a starting point for discussion.

We note that the UK Water Industry Research (UKWIR) Future Asset Planning project is also exploring the potential development of asset health measures to identify those that can be used consistently across the sector and provide assurance that companies are being good stewards of assets. We are a member of the project steering group for this collaborative research and the scope of the work has some broadly similar high level aims to ours. But the

⁶¹ Ofwat, '[Asset Management Maturity Assessment – insights and recommendations](#)', October 2021.

⁶² Ofwat, '[Asset Management Maturity Assessment – insights and recommendations](#)', October 2021, p. 30, recommendation #2.

timescales for PR24 necessitate the collation of feedback on potential additional asset health measures at this point rather than waiting until the final UKWIR findings are published.⁶³

We will consider the feedback from this consultation and the outputs of the UKWIR research in developing our asset health information requirements. We are therefore keen to explore and collate feedback through this consultation on any potential asset health measures that could provide insight into levels of asset health at a sector level, future capital maintenance activity requirements, and to investigate if the future is likely to be different to the past.

It is our intention that any **additional asset health measures discussed in this consultation would not be performance commitments at PR24**, but simply items of additional information that we will monitor over time and potentially use to inform our assessment of efficient costs at PR24. As discussed in our November discussion paper '[PR24 and beyond: Performance commitments for future price reviews](#)', **performance commitments that measure asset health** will be confirmed in 2022 following completion of the UKWIR Future Asset Planning project. We encourage companies to respond to '[PR24 and beyond: Performance commitments for future price reviews](#)' and engage through the ongoing outcomes working group to provide specific feedback on PR24 asset health performance commitments.

5.3.1 Asset health measure assessment criteria

We want any additional information we collect about asset health to be targeted and focused. The purpose of this information is to enable companies to provide assurance that they are being effective stewards of their assets. More specifically, additional asset health measures could be used as:

- **Information to inform PR24 wholesale base cost assessment** – help to ensure that our independent estimate of efficient wholesale base costs is sufficient to meet future capital maintenance requirements.
- **Information that can be used to monitor asset health over time** – help to hold companies to account in this area and enable more accurate asset health comparisons between companies and over time.⁶⁴
- **Incentives for long term resilience** – monitoring of greater amounts of comparable asset health information may help to strengthen incentives for long term resilience and reinforce the long-term focus.

We consider potential asset health measures should be assessed against the following criteria.

⁶³ At the time of this publication, the current timeline for the UKWIR Future Asset Planning project estimates the final report will be made available to the project steering group on 18 February 2022.

⁶⁴ We are mindful that asset health measures should aim to focus on outcomes, rather than outputs required to deliver those outcomes, as far as possible to ensure that companies have the flexibility to innovate.

Table 5.1: Potential asset health measure assessment criteria

Criterion	Description
Relevant	Information should be relevant to what we are trying to monitor and measure (ie asset health). It should be consistent with the current definition of asset health. ⁶⁵
Quantifiable and objective	There should be an unambiguous definition with clearly defined data requirements. This should facilitate comparability between companies to understand the benefits their individual asset management strategies deliver.
Diagnostic	The asset health measure should provide insight regarding what could be driving asset health trends and changes going forward.
Historical information	Historical trends should ideally be available for the measures to support analysis of benefits delivered through prior investment and assess the impact of management decisions.
Transparent	Measures should be transparent and expressed simply so they are readily accessible to stakeholders. Measures should be discrete and not require aggregation of a number of different aspects of asset health

Other factors are also important to consider. For example, the coverage that measures have across asset types or classes is important, so that measures can provide a complete view of water and wastewater assets or infrastructure and non-infrastructure assets.

We recognise that individual asset health measures may not meet all the criteria listed above. For example, back-casting of new asset health measures may not always be possible. We therefore anticipate that a range of complementary asset health information will be required to enable us to form a holistic and complete view of, and draw meaningful conclusions about, the state of asset health in the sector.

5.3.2 Analysis of potential asset health measures

There is a need to monitor a more complete picture of asset health to inform more robust decision-making in this area by companies and Ofwat. Assessing and monitoring asset health therefore requires a combination of measures at asset, facility and system level, including lagging and leading measures, to:

- better understand the condition and relevant characteristics of assets, including their operating environment;
- identify emerging risks and trends that may affect the asset health of individual assets, asset types or groups of assets;
- understand the contribution of asset health to network/system resilience and how risks are balanced/managed within;

⁶⁵ The Ofwat [lexicon](#) developed for the AMMA currently defines asset health as an indicator of a company's ability to continue to perform its functions for the benefit of customers, the environment and wider society now and in the future. In addition, the ongoing UKWIR project 'Future Asset Planning' currently defines asset health as a property of an asset that reflects its ability to perform its function, by considering modes of failure that would affect the value provided. Failure modes associated with inadequate capacity (in terms of storage volume, delivered flow, or pollutant loading rate) are excluded, except where these result from deterioration of the asset.

- monitor the balance of preventative and corrective maintenance activity across the asset base;
- monitor asset and network performance derived from asset failures and asset deterioration; and
- monitor that investments in the asset base are being made in a timely and appropriate way.

To this end, we have collated a long list of potential measures for review from a variety of information sources including: PR19, previously reported measures, companies' AMMA submissions and the ongoing UKWIR research to identify potential candidates for additional asset health measures.⁶⁶ The list includes lagging and leading measures, and measures at asset, facility and system level. There may be a degree of overlap between measure types.

The long list has also been informed by discussions at the CAWG, 'Forward looking capital maintenance assessment' 28 September 2021, where several companies indicated they still collect serviceability measures that were previously reported to us and that they could provide a useful basis for discussion in the context of collecting additional asset health information. United Utilities also presented the idea of using a variety of asset health measures to form a more systems-based view of asset health.⁶⁷

In compiling these measures, we have excluded PR19 common performance commitments related to asset health. We have also excluded measures that: we already collect as part of the Annual Performance Reports (APRs); had significant overlap or were duplicated with other listed measures; or did not have a sufficiently clear definition. Potential candidate PR24 performance commitments discussed in '[PR24 and beyond: Performance commitments for future price reviews](#)' are also excluded.⁶⁸ But we note that candidate PR24 common performance commitments that do not form part of the final outcomes framework for PR24 could potentially become part of our long list of asset health information we collect and monitor over time to enable us to form a holistic and complete view of the state of asset health in the sector.

As part of this process, we also considered measures related to asset age, which we collect in the APRs for certain assets (eg water infrastructure assets). We have excluded asset age from our long list of asset health measures since we consider this information less relevant on its own. In addition, the information submitted in the AMMA showed that only three companies included asset age in their list of asset health measures used for decision-making,

⁶⁶ As part of the AMMA we also collected a list of asset health and operational resilience measures, including regulatory and internal measures that companies use for decision-making. Many of these were wide ranging measures which varied in definition and scope, making it difficult to compare or standardise across companies.

⁶⁷ In the presentation, United Utilities summarised its paper '[Asset health in the water sector – proposal for a framework](#)' whereby multiple measures are collected that reflect 'fitness', 'wellness' and 'life expectancy'.

⁶⁸ We reiterate that PR24 asset health performance commitments will be considered following the findings of the UKWIR project 'Future Asset Planning'.

suggesting that this is an attribute more useful when considered alongside other factors (such as in asset deterioration models).

As a result of this process, we have identified four key types of measures that can help to understand different aspects of asset health:

- **Asset characteristics**, such as asset condition, can provide information about specific assets or groups of assets.
- **Maintenance activity** undertaken by companies (eg unplanned maintenance).
- **Asset and service performance measures** (excluding PR19 common asset health performance commitments) such as sewer blockages.
- **Aggregated measures** summarise multiple indicators and information into indexes to gauge asset health (eg Base Asset Health).

Table 5.2 below summarises the types of asset health measures identified, provides examples of such measures, and presents key comments on the feasibility of these measures based on the criteria outlined in section 5.3.1.

Table 5.2: Initial list of potential additional asset health measures^{69 70}

Type of measure	Example measures Summary of pros and cons	Summary of pros and cons	Conclusion
Asset characteristics	Asset condition grade (for assets or groups of assets)	<ul style="list-style-type: none"> • Relevant but incomplete picture of asset health. Additional factors such as operating conditions and previous investment decisions are also relevant • Quantifiable but quality data lacking for some asset types. • Diagnostic – Targeted to specific asset parameter. • Some historical information available. • Transparent – Straightforward and easy to understand. 	Asset condition grade data would provide useful diagnostic information but is likely to be time consuming to collect. Suggest collecting once every price control period.
Maintenance activity	<ul style="list-style-type: none"> Unplanned maintenance Planned network rehab Proactive vs reactive maintenance Mean Time To Repair, Mean Time Between Failures Maintenance backlog Asset inspections planned vs actual 	<ul style="list-style-type: none"> • Relevant but incomplete picture of asset health. • Quantifiable with no standardised definition in some cases but these may be similar across companies. • Diagnostic – Target maintenance activity so easier to monitor behaviour. • Historical information available from companies in some cases. • Transparent – Straightforward and easy to understand. 	We seek views on which measures can help to provide a more complete understanding of asset health in the sector. We would propose to collect the selected measures annually in a standardised way.
Asset and service performance	<ul style="list-style-type: none"> Compliance Risk Index (CRI) (water treatment works, supply points, service reservoirs and water supply zones sub-measures) Properties at risk of receiving low pressure Sewer blockages Percentage of population equivalent, served by sewage treatment works with numeric limits, which were non-compliant with: sanitary look-up table limits or nutrient limits, urban wastewater treatment directive (UWWTD) look-up table limits or nutrient limits 	<ul style="list-style-type: none"> • Relevant but incomplete picture of asset health. • Quantifiable and objective with common definitions and methods within the sector for most measures. • Variable diagnostic capability. For example, there may not always be a clear link between performance measures and asset health because some assets can deteriorate and still provide adequate levels of service. • Historical information available for most measures. • Variable levels of transparency. For example, index measures such as CRI may be less 	We seek views on which performance measures might be more suitable for monitoring given the criteria above. We would propose to collect selected measures annually in a standardised way.

⁶⁹ Reporting definitions for some of these measures are not yet agreed and we invite companies to draft a definition or comment on the existing definitions where these are available.

⁷⁰ The coverage of a number of these measures, in their current definitions, is restricted to specific asset types or groups of assets (eg non-infrastructure assets); however, we are considering the list of measures with the potential to expand these allocations beyond their current definitions where this may be useful for our purposes.

	Number of equipment failures	transparent compared to more straightforward measures such as sewer blockages.	
	Unplanned Interruptions greater than 12 hours		
	Disinfection, Reservoir or Process control Index		
Aggregated measures	Base asset health index (BAH)	<ul style="list-style-type: none"> • Relevant and can promote a leading, in-the-round view of asset health. • Quantifiable but subjective and not comparable - Variety of methodologies and gaps in data available across companies. • Diagnostic as these measures could target assets and groups of assets. • No historical information available, and likely to be challenging to produce data on a consistent basis for all companies. • Less transparent as they often combine information from multiple measures/sources and may hide poor performance. 	Transparency, comparability and objectivity issues. It is likely to be challenging to collect data on a consistent basis across companies for PR24. Potentially more of a longer-term ambition for PR29.
	Overall Equipment Effectiveness (OEE)		
	Asset risk (monetised likelihood*consequence)		

Reporting definitions for some of these measures presented in Table 5.2 are not yet agreed and we invite companies to draft a definition or comment on the existing definitions (where available).

In addition to the measures presented in Table 5, we also identified measures with insufficient definitions or information to be included in our example measures table, but which we found potentially interesting to explore with the sector, including storm overflow performance, the gap between design capacity and reliable output, asset downtime or system/process failure measures.

We also encourage companies to collect a wide range of asset health information beyond what is reported to us. This internal information is for companies to manage and may not necessarily need to fulfil all the criteria listed in section 5.3.1 above.

Overall, we consider the collection of additional asset health information will be required to enable us to form a holistic and complete view of, and draw meaningful conclusions about, the state of asset health in the sector. We invite companies to provide views and comments on the asset health measures discussed above. We also invite companies to propose any additional measures which may help to provide a more complete picture of asset health.

5.4 Consultation questions

Capital maintenance and asset health

19. Do you agree with the different elements / approaches to introducing more of a 'forward-look' into our approach to assessing capital maintenance expenditure? Are there other elements / approaches we could consider?
20. Do you have any comments on the proposed long list of asset health measures in Table 5, particularly in relation to their suitability and how feasible they are to collect? Please include any reporting or definition changes you would like us to consider and provide suggestions for other measures not included in this list.⁷¹

⁷¹ The UKWIR Future Asset Planning project has developed a draft list of asset health measures which companies are encouraged to consider when providing feedback.

6. Cost-service relationship

Cost-service relationship: summary

- Our ambition for PR24 is to build on our PR19 approach to setting cost allowances and performance levels by drawing a more explicit link between costs and outcomes.
- We recognise that the cost-service relationship is challenging and complex. We therefore propose to take a pragmatic and proportionate approach moving forward.
- Our proposed approach is based on answering two key questions:
 - What does base buy?
 - What cost adjustments are necessary if the performance commitment (PC) level for delivery in the 2025-30 period differs from what base buys?
- To determine what base buys, we propose to:
 - evaluate if performance delivered by base should be expressed as a common performance level or a company specific performance level;
 - determine an appropriate initial baseline performance level for an efficient company in 2024-25 ('Year 0'); and
 - forecast the performance level deliverable from base for an efficient company by 2029-30 and over the longer term.
- Our key assumptions in this approach are:
 - the performance level achieved by base should be set as a common performance level, unless there is robust evidence that it should be set on a company-specific basis;
 - on average we consider that efficient companies will deliver their PR19 performance commitments;
 - efficient companies will continue to improve performance over the long term from base expenditure; and
 - we will need to review the performance level funded by base at each price review and account for changes (eg new technology).
- We propose to use a range of information to determine what performance level can be delivered from base, including:
 - historical outturn performance data up to and including 2022-23;
 - PR19 performance commitment levels for 2023-24 and 2024-25;
 - PR19 business plan forecasts; and
 - companies' PR24 business plan forecast of what base buys.
- We also discuss the viability of econometric modelling approaches to explore the cost-service relationship, including: (i) modelling the cost-service relationship for individual PCs (eg leakage); and (ii) combining multiple PCs into a composite variable.
- We continue to explore potential approaches to making cost adjustments to allowances when companies proposed performance commitment levels for the 2020-25 period differ from those expected to be delivered from base costs.

At a price review we expect companies to set out business plans that will efficiently deliver the long-term requirements of customers, society, and the environment. Cost assessment and outcomes are two of the three key building blocks of the price review alongside risk and return. **It is important that we set stretching but achievable cost allowances and performance levels.** This helps to ensure that current and future customers pay no more than efficient costs and receive high quality services from their water company.

Figure 6.1: The three key building blocks of the price review



At PR19, we forecast the level of service improvements that could be delivered based on our assessment of company forecasts of future improvements and historical improvements achieved through base. Most companies proposed to achieve these service improvements to common PCs without requesting additional expenditure as enhancement or as a cost adjustment claim.⁷²

Our analysis found that the overall level of stretch across costs and outcomes was achievable.⁷³ For example, we found that better outcome performance should not necessarily increase cost, as a comparison of historical cost and outcomes data suggested a positive relationship between historical cost efficiency and outcome performance. Some companies also performed in the upper quartile for both costs and outcomes.

The Competitions and Markets Authority (CMA) broadly supported our approach, with the exception of leakage. The CMA identified there was no clear relationship between cost and

⁷² Leakage being the exception, where we challenged companies to consider a 15% reduction.

⁷³ Ofwat, '[PR19 final determinations – Overall stretch on costs, outcomes and cost of capital policy appendix](#)', December 2019.

outcomes improvements: "[...] there is no clear link in the evidence from AMP6 between the performance against PC and ODI targets, and the costs incurred by the water companies".⁷⁴ As recognised by the CMA, "In some cases, improvements to service could be achieved at little cost or may be of a recurring nature that would be included in base funding".⁷⁵ The CMA also supported our analytical findings that "[...] high performing companies on cost were often high performers on service".⁷⁶ The CMA concluded for PR19 that "Overall, with the exception of leakage, we found that at a sector level that Ofwat had not imposed targets that were unachievable".⁷⁷ We therefore consider it appropriate to expect base expenditure to fund a level of service improvement. But to also develop an assessment approach that accounts for examples "[...] where improvements in performance will only come at a cost".⁷⁸

Our ambition for PR24 is to build on our PR19 approach to setting cost allowances and performance levels by **drawing a more explicit link between cost allowances and the service levels we set (ie the cost-service relationship)**. The output from our assessment of the cost-service relationship will be an overall total expenditure allowance that will enable an efficient company to deliver suitably stretching levels of service for the benefit of customers and the environment.

In our PR24 May consultation, '[Creating tomorrow, together](#)', we said we are considering forecasting the performance level that could be delivered from base funding for each common performance commitment. This should help to ensure a coherent link between costs and outcomes. This chapter presents our current thinking on how to approach this task at PR24.

We recognise **the cost-service relationship is a challenging and complex area and there is no simple solution** to better account for it within the PR24 regulatory framework. We therefore **propose to take a pragmatic and proportionate approach moving forward**. We invite companies to consider the feasibility of options within the time available leading up to PR24, when providing feedback on our proposed approaches or proposing alternative approaches.

We note that no decision has been made yet on the PR24 performance commitments. Our current thinking is discussed in our November 2021 paper, '[Performance commitments for future price reviews](#)'. We also expect to provide a discussion paper covering performance commitments that measure asset health and asset resilience outcomes in early 2022, following completion of the UKWIR Future Asset Planning project that is developing asset health indicators and is due to complete in December 2021.

⁷⁴ Competition and Markets Authority, '[Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determination, final report](#)', March 2021, p. 629, paragraph 7.92.

⁷⁵ Ibid, p. 629, paragraph 7.94.

⁷⁶ Ibid, p. 630, paragraph 7.95.

⁷⁷ Ibid, p. 631, paragraph 7.100.

⁷⁸ Ibid, p. 630, paragraph 7.99.

Performance commitment terminology

In this chapter we use the terminology **common performance commitment (common PC)** to refer to performance commitments with common definitions covering customers' key priorities and stretching performance levels. The focus of this chapter is on common PCs.

A **common PC** may have either:

- a **common performance commitment level (common PCL) across all companies**, for example supply interruptions and pollution incidents at PR19; or
- a **company specific performance commitment level (company specific PCL)**, for example leakage and per capita consumption at PR19.

6.1 Defining the framework

Our approach to exploring the cost-service relationship is based on the key principles we set out in our PR24 May consultation:

- customers should fund an allowance commensurate to the level of challenge faced by an individual company;
- we will develop better understanding of the underlying drivers of differences in service quality performance across companies;
- we will make greater use of symmetrical adjustments; and
- we will account for historically funded service improvements, to ensure customers do not pay twice for improvements and that these investments are reflected in the levels of stretch that is set.

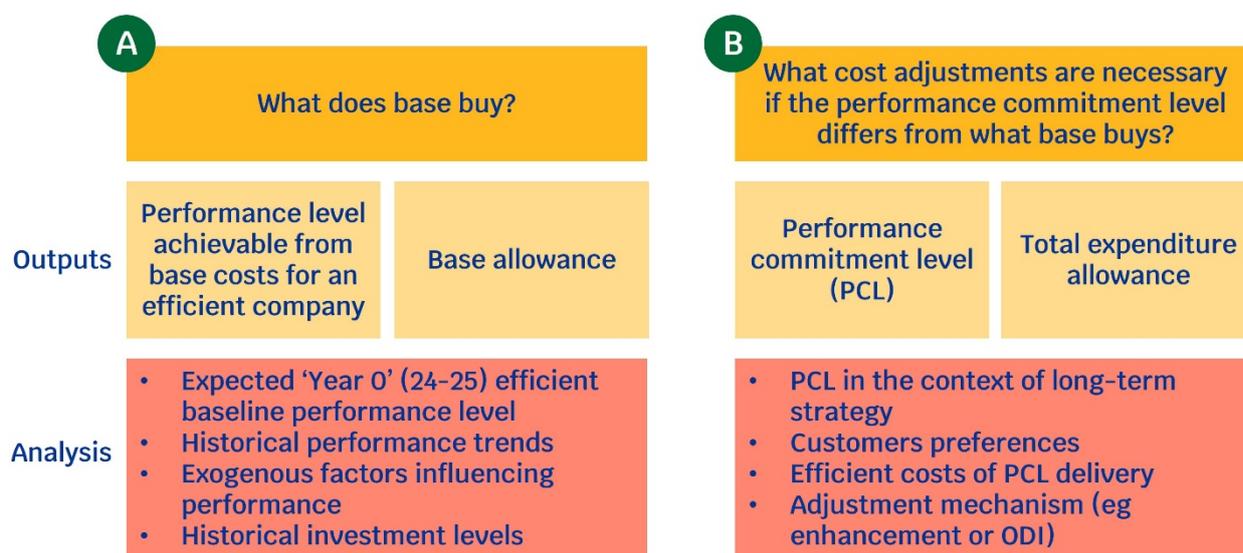
In response to the consultation, companies agreed that the relationship between cost and services is a key issue for PR24 and we have since discussed ways to explore the cost-service relationship in more detail at the CAWG, 'Cost and service link' 14 September 2021.⁷⁹ Yorkshire Water in collaboration with Baringa presented a paper at the workshop and to the Future Ideas Lab on assessing the relationship between cost and performance for PR24 and discussed how cost allowance adjustments could be applied.⁸⁰

⁷⁹ CAWG, '[Cost and service link](#)', 14 September 2021.

⁸⁰ Yorkshire Water and Baringa, '[Assessing the relationship between cost and performance for PR24](#)', October 2021.

In this section we build on consultation responses to our PR24 May consultation, CAWG discussions and Yorkshire Water’s paper. We outline our proposed high-level approach for assessing the cost-service relationship below.

Figure 6.2: High-level cost-service assessment approach



Question A focuses on forecasting the performance level that can be delivered from base costs by an efficient company over the long term. To determine this level, we need to consider the following questions:

- Should the performance level funded by base be assessed at a common performance level across all companies or on a company specific basis?
- What baseline performance level are efficient companies expected to achieve by 2024-25 ('year 0')?
- What does historical performance and expenditure data indicate is stretching but achievable performance level?
- Are there any exogenous factors that influence the performance levels that can be achieved?
- What forecasts of improvements expected from base expenditure have companies' used to inform their long term delivery strategies, which we have requested in ['PR24 and beyond: Long-term delivery strategies and common reference scenarios'](#)?

Question B focuses on how to ensure companies receive funding commensurate with the quality of service they provide to customers when the performance commitment level differs from that expected to be delivered from base. We continue to explore potential approaches to making cost adjustments to allowances when companies' performance commitment levels set for delivery in the 2025-30 period differ from those expected to be delivered from base costs. We have not yet decided on the approach we will adopt for the

PR24 methodology in this area. We note that in response to our PR24 May consultation and during discussions at the CAWG, companies have generally supported the use of existing mechanisms, such as enhancement allowances or outcome delivery incentives (ODIs).

The sub-sections below set out our current thinking on how we could go about answering the questions above, reflecting on the engagement we have had with companies to date. We focus on question A as this is closely related to the assessment of base costs and may require the collection of additional data ahead of the PR24 methodology. We provide an overview of expectations relating to question B and intend to provide further details of our position in our PR24 methodology.

We welcome detailed feedback on the discussion below, as well as additional proposals to consider ahead of the draft methodology. We also invite companies to identify additional data which could be collected to further elucidate the cost-service relationship.

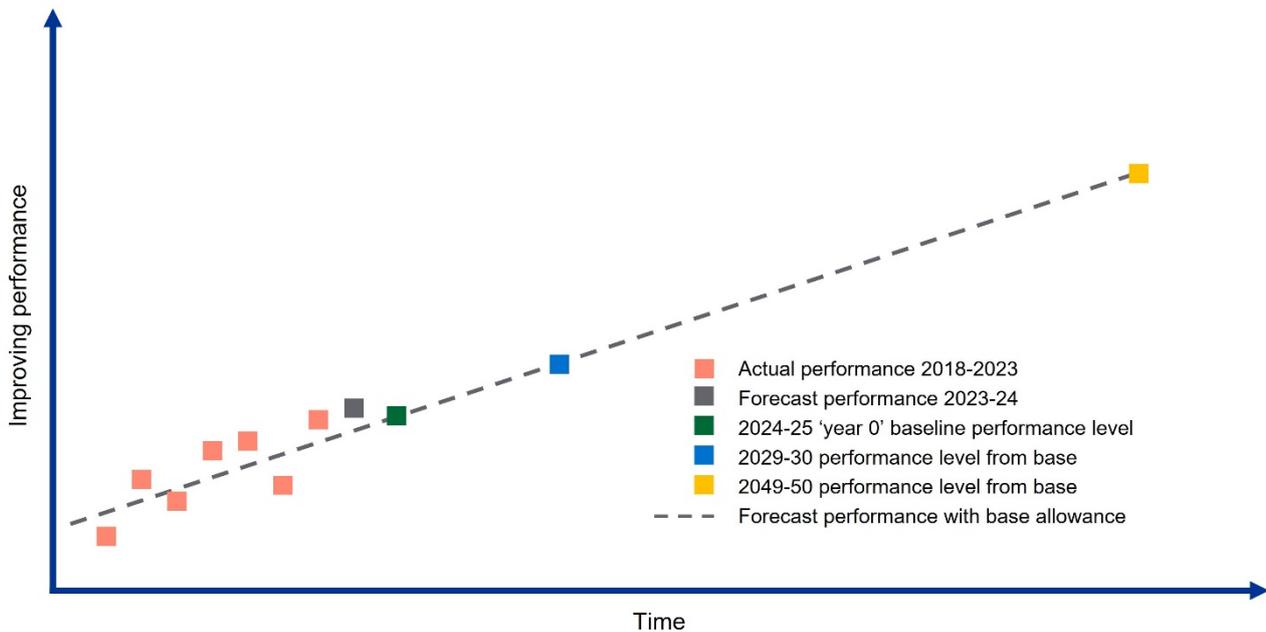
6.2 What base buys

Determining a stretching but achievable performance level from base expenditure is an important output given the interaction with other areas of the regulatory framework. For example, it allows us to assess if additional funding is required if a company's performance commitment level is more stretching than that expected to be delivered by an efficient company from its base funding (ie question B).

Our proposed approach to determining what base buys for a given performance commitment consists of three components:

- evaluating if performance delivered by base should be expressed as a **common** performance level across all companies or a **company specific** performance level;
- determining an appropriate initial **baseline performance level** for an efficient company in 2024-25 ('Year 0'); and
- forecasting the **performance level deliverable from base** for an efficient company by 2029-30 and over the longer-term.

We set out our proposed approach in terms of these three components in the sub-sections below. Figure 6.3 illustrates our proposed high-level approach to forecasting performance levels that are deliverable from base costs by an efficient company. This is based on a PC that is evaluated in terms of a common performance level across all companies, where the initial baseline position is assumed to be the PR19 performance commitment level of the PC in 2024-25.

Figure 6.3: Forecasting performance levels deliverable from base costs at PR24⁸¹

6.2.1 Common or company specific performance level delivered by base

For each common PC, we will evaluate if performance delivered by base should be expressed as a common performance level across all companies or a company specific performance level.⁸²

At PR14 we requested that companies proposed outcomes to cover all elements of their services that customers valued highly. Through comparative analysis of the PCs submitted we set upper quartile performance levels, where a high proportion of companies were proposing incentives on broadly similar aspects of service delivery, and where there was a high degree of comparability.

At PR19, we considered it remained appropriate to continue setting common performance levels and set these for five common PCs. Water supply interruptions, pollution incidents and internal sewer flooding had standard definitions and good historical datasets to enable comparisons across companies.⁸³ We did not consider there to be clear reasons why companies should not achieve the same stretching levels of performance for these PCs. We considered that significant improvements in performance could be achieved through changes in operational strategies and practices to align with most efficient companies. As a

⁸¹ Data in chart representative of the position at submission of business plans where actual performance levels will be available for 2022-23 with company forecasts of performance beyond this point.

⁸² For the avoidance of the doubt, we note this discussion relates to the level of performance delivered by base, rather than the performance commitment levels that companies will be required to deliver (which may or may not coincide with the performance level expected from base).

⁸³ We made an adjustment to the common performance commitment level for pollution incidents for Hafren Dyfrdwy. The company has a very small sewerage network and so on a normalised basis its performance is sensitive to a small number of incidents.

result, we considered that poor performance in these PCs was usually a result of ineffective operational practices rather than company-specific regional or asset related issues. We also set common performance levels for compliance risk index and treatment works compliance as these relate to standards that companies are required to meet and have been funded to achieve. For the remaining PCs we set company specific performance levels. Leakage and PCC are both examples of common PCs which had performance commitment levels for the 2020-25 period set on company specific basis.

At PR24 we propose to continue to use common performance commitment levels where appropriate. **Our starting assumption is that for PCs that had common performance commitment levels set at PR19, the performance level achieved through base will be common across all companies.** We also assume that any new PCs relating to compliance standards that companies have to meet will be set as common performance levels. For the remaining PCs, we are considering the extent to which **the performance level achieved by base should be set as a common performance level**, unless there is robust evidence it should be set on a company-specific basis.

6.2.2 Determining a baseline performance level

At PR24 we will not have companies outturn performance for the complete 2020-25 period. We therefore will need to use the available information to determine a baseline performance level for setting our performance expectations for 2029-30 and the long-term.

Our starting assumption is that on average we consider that efficient **companies will deliver their PR19 performance commitments.** This means **the performance commitment level for 2024-25 ('year 0') will be our starting point** for determining the baseline when forecasting what base buys for the 2025-30 regulatory period. We will consider what represents an appropriate baseline for individual companies in the context of the available industry outturn performance for the 2020-25 period.⁸⁴ Our primary consideration will be to ensure that customers are protected from paying twice for the same performance improvements while also ensuring that the incentives for companies to deliver performance improvements are not distorted.

Where new performance commitments are proposed for PR24 we will consider the appropriate 'year 0' performance level based on available data sources such as shadow performance reporting, company forecasts and related historical data sets. We recognise that it may be necessary to request companies to back-cast data for these PCs.

Where sufficient data is available, we are investigating the possibility of **determining the 'efficient' performance level for each company through econometric modelling** that

⁸⁴ For example, it may be necessary to deviate from the 2024-25 performance commitment level if the available outturn data indicates a significant majority of companies are likely to fail to deliver or substantially exceed this performance level.

considers the influence of exogenous factors, endogenous factors and differences in historical levels of enhancement expenditure on company performance. Such an approach was discussed by Yorkshire Water's Future Ideas Lab paper, '[Assessing the relationship between cost and performance for PR24](#)'. This could be used to both determine an appropriate 2024–25 baseline performance level and to assess how a company has performed against an expected 'efficient' performance level over the historical period.

We consider that PCs such as leakage and per capita consumption (PCC) are potential candidates for the application of an econometric modelling approach.⁸⁵ These PCs both have significant variations in performance levels between companies and at PR19 had performance commitment levels that were set on a company-specific basis. Our industry working groups have already identified a number of exogenous and endogenous factors that companies consider would influence the performance levels achievable for these PCs.

We welcome feedback on our proposed approach to determining a baseline efficient performance level. We also invite suggestions of PR24 PCs that may be candidates for the econometric modelling approach, as well as explanatory factors that may explain differences in the 'efficient' performance level between companies and over time. We note that while feedback from companies has been supportive of the collection of more granular data there has been recognition of the considerable time and resource inputs required to ensure consistency through robust definitions. Therefore, we recognise the need to ensure additional data requests are proportionate and beneficial given the limited resources available.

6.2.3 Proposed approach to determining what base buys

In the sub-section above we have proposed how we would approach setting an efficient performance baseline. This sub-section describes how we propose to determine the level of performance improvement we would expect an efficient company to make from this baseline in both the 2025–30 period and across the longer term. Our starting assumption is that **companies will continue to improve performance over the long-term from base expenditure**, as they have been doing over previous periods.⁸⁶

The approaches we propose to adopt to determine what level of performance is deliverable from base costs by an efficient company are set out below. We will adopt different

⁸⁵ We use PCC and leakage as illustrative examples noting that PR24 performance commitments have not yet been confirmed. We also note that distribution input is being considered as a candidate PC in replacement of leakage and PCC. See further discussion in Ofwat, '[PR24 and beyond: Performance commitments for future price reviews](#)', November 2021.

⁸⁶ As stated earlier in the chapter the CMA recognised that “In some cases, improvements to service could be achieved at little cost or may be of a recurring nature that would be included in base funding”. Competition and Markets Authority, '[Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determination, final report](#)', March 2021, p. 629, paragraph 7.94.

approaches dependent on whether performance is expressed as a common performance level across all companies or as a company specific performance level.

We seek feedback on the proposed approaches and encourage alternative proposals to consider ahead of the PR24 methodology. We note that **we expect to review the performance level funded by base at each price review to account for the impacts of factors such as technological change and outturn performance.**

Common performance level PCs: determining what base buys

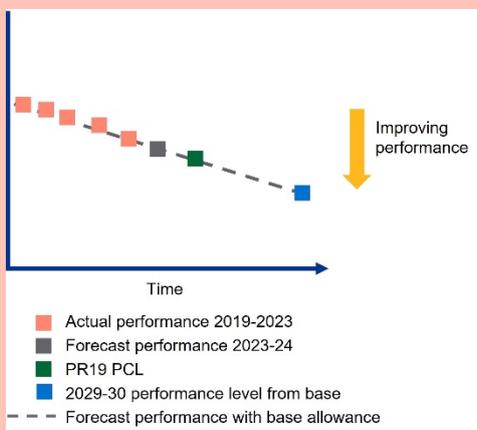
We would expect to use the following data to forecast the long-term common level of performance achievable by all companies from their base cost allowance:

- historical outturn performance data up to and including 2022–23;
- PR19 performance commitment levels for 2023–24 and 2024–25 (where available);
- PR19 company forecasts (where available); and
- companies' PR24 business plan forecasts of what base buys.

We expect all companies to deliver their PR19 performance commitment levels and as discussed in the sub-section above for existing PCs this would form the starting point for determining a baseline performance level for an efficient company. For new PCs we would use available data sources to set an efficient baseline level. Using the data described above we would forecast a performance trend for a given PC and use this to establish the improvements we would expect an efficient company to deliver through its base allowance. If we assume the PR19 performance commitment level at 2024–25 is the common baseline level this will result in a varying level of challenge across companies in terms of the rate of performance improvement required in the 2025–30 period. The level of challenge would be dependent on an individual company's outturn 2024–25 position relative to the common PR19 performance commitment level.

The figure below illustrates this approach. We use a combination of outturn and PR19 forecast performance commitment level to assess how upper quartile performance has improved over time. We use this estimated relationship to project forward to the expected 2029–30 level. In this example, a lower level is representative of improved performance, for example a reduction in number of pollution incidents.

Figure 6.4: Common performance levels – what base buys example

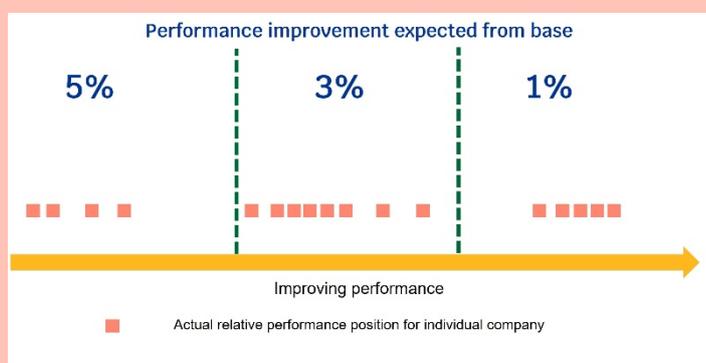


Company specific performance level PCs: determining what base buys

The company specific performance level funded by base for the 2025–30 period would be determined by first setting the efficient baseline level as described in the sub-section above. This could be through considering the 2024–25 performance commitment levels and outturn performance or through econometric modelling. We would then review the historical rates of performance improvements and consider whether the data supported a common rate of improvement in performance levels across all companies (eg 5%) or if the expected rates of improvement should be company specific.

One approach we are considering is to apply ‘performance improvement bands’, where we consider there is greater scope for improvement at lower levels of service (ie poorer performers). Such an approach gives greater recognition to the performance improvements that have been delivered by higher performing companies in previous periods. Historical performance data could be used to set bands of expected improvement for individual companies, with the scale of improvement reducing toward the frontier performance to reflect the greater level of challenge. This aligns with feedback from companies that some will have ‘spare capacity’ to implement easier, lower cost solutions. The concept is illustrated in Figure 6.5 below.

Figure 6.5: Potential for differing levels of performance improvements delivered through base



For both common and company specific performance level PCs, it may also be necessary to consider the following information when determining the performance level funded by base for the 2025–30 period:

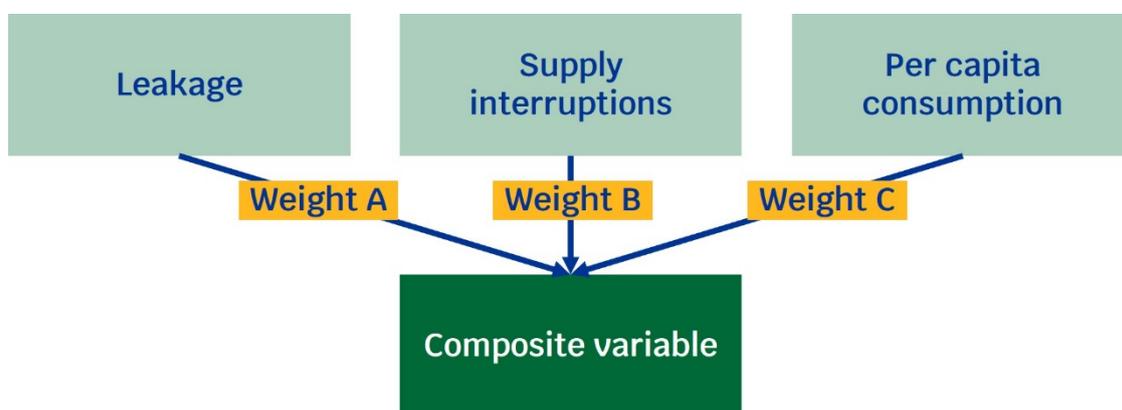
- the **impact of historical enhancement allowances** and expenditure on company performance, where relevant;
- the business plan **performance forecasts** submitted by companies at PR19; and
- companies' **PR24 business plan assessments** of the levels of performance that can be delivered through their base allowance.

A company would also have the opportunity to submit base cost adjustment claims, as detailed in section 4, if it considers that the forecast performance level deliverable from base is not achievable given its specific circumstances. As discussed in section 4 we would expect claims to be well evidenced and to support the application of symmetrical cost adjustments.

Composite performance variable

During the CAWG the potential use of a composite performance variable to develop modelling of the cost-service relationship was also raised. A composite variable would potentially combine a number of PCs appropriately weighted, as illustrated in the figure below. This could then be used in conjunction with other exogenous and endogenous variables and expenditure figures to investigate the cost-service relationship.

Figure 6.6: Example of composite performance variable



A composite variable has a certain attraction in that it avoids the challenge of allocating cost lines to individual performance commitments which would be required in any attempt to model an individual PC. The composite variable may also be of use in exploring the combined level of stretch across multiple PCs. However, we have concerns regarding its use. Our principal concern is that developing such an approach would be analogous to adding an endogenous service variable to the base model. We have highlighted earlier in this paper our concerns with including endogenous variables in econometric models. Such an approach risks introducing perverse incentives and is would be contrary to our cost assessment principles (see chapter 2). The use of any composite variable would additionally be complicated by the requirement to make assumptions in developing appropriate weightings to combine the PCs which could lead to an unrepresentative variable.

6.3 Adjustments for a performance commitment level that differs from that expected to be delivered from base costs

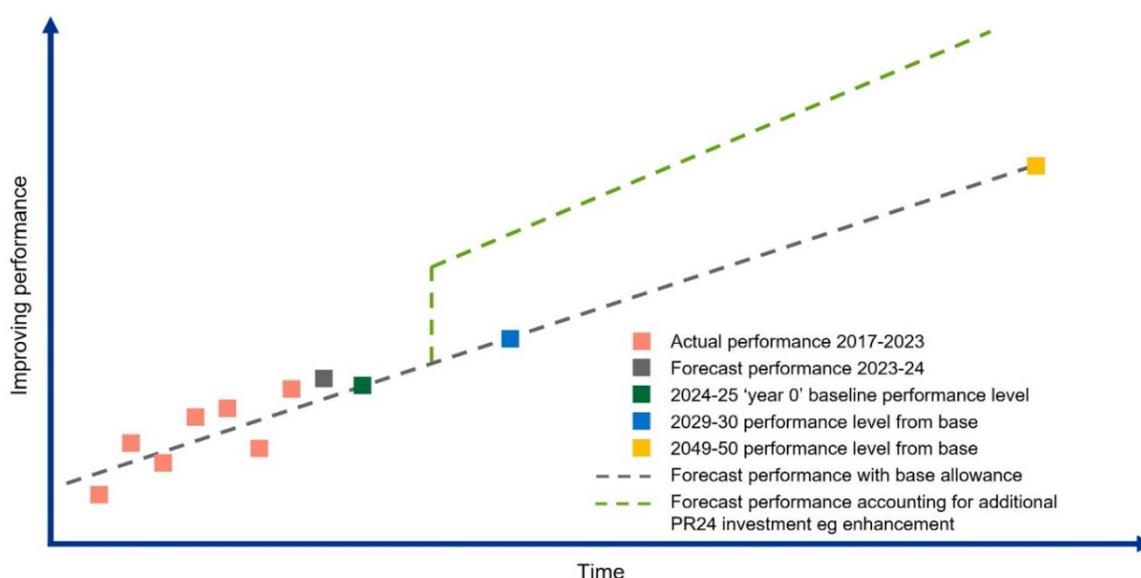
We expect companies to consider the level of performance that is funded by base in the context of the long-term challenges they face and the long-term outcomes they have

committed to deliver. We have set out our expectations of how companies should approach their long-term strategies in our ['Long-term delivery strategies and common reference scenarios'](#) discussion paper. Companies are expected to evidence where they may need to deliver performance levels beyond that funded by base as part of a best value long-term plan supported by customers. Conversely, companies are expected to evidence cases where customers support the delivery of a less stretching performance level than that funded through base.

In response to the PR24 May consultation, companies agreed that such adjustments could be made through cost allowances or ODI outperformance or underperformance payments. We continue to explore the mechanisms for making these adjustments and have not yet decided on the approach we will adopt.⁸⁷ We therefore welcome proposals of how best to make such adjustments in response to this consultation and will provide further details of our position in our PR24 methodology.

We also expect companies to identify the performance impact that the proposed investment beyond base allowances will have on each common PC over the long term. This is illustrated in the figure below and is important to ensure that customers will not pay twice for improvements.

Figure 6.7: the expected impact of enhancement investment on performance⁸⁸



⁸⁷ We recognise there may be a need to link funding to certain scheme specific outputs at PR24 in order to protect customers from the risk of non-delivery, for instance, where the benefits of significant investment cannot be easily monitored. We are proposing to do this through price control deliverables (PCDs). See further discussion in Ofwat, ['PR24 and beyond: Performance commitments for future price reviews'](#), November 2021.

⁸⁸ Data in chart representative of the position at submission of business plans where actual performance levels will be available for 2022-23 with company forecasts of performance beyond this point.

6.4 Consultation questions

Cost-service link

21. Do you agree with the high-level approach to determine 'what base buys'? Can you define any additional analysis or information that could support this process?
22. Do you consider it would be feasible to assess the 'efficient' baseline performance level for each company for individual PCs such as leakage and PCC through econometric modelling? Are there any other PCs where you consider this could feasibly be attempted?
23. The need to collect further granular data to elucidate the cost-service relationship was highlighted by companies in response to our PR24 May consultation. Can you propose any data it would be proportionate to collect to support the high-level approach outlined in this chapter?
24. What are your views on attempting to use of a composite variable to investigate the cost-service relationship, in the context of the methodological issues and complexities we outlined?
25. Do you have any proposals for how to make adjustments where a performance commitment level differs from that expected to be delivered from base costs?

7. Residential retail cost assessment

Residential retail cost assessment: summary

- We welcome feedback on the cost drivers used to assess efficient residential retail costs at PR19, as well as suggestions for other cost drivers to consider at PR24.
- We intend to ask companies to separate out the part of their provision of bad debt costs to do with Covid-19 that was made outside of their standard methodology in the PR24 business plan tables. We are interested to understand if companies have any comments regarding this proposed approach.

We [consulted](#) on our high-level approach to the residential retail control in our PR24 May consultation '[Creating tomorrow, together](#)', and subsequently discussed key cost issues in our residential retail CAWG session in August 2021.⁸⁹ We have also consulted on new reporting requirements for new appointees, which we could potentially use to benchmark incumbent companies' residential retail costs.⁹⁰

We value the input stakeholders have provided to us through our previous engagement. We will consult on our proposed approach to PR24 as part of our draft methodology. **Although we have previously discussed the cost drivers for residential retail as part of our engagement, this continues to be a particular area of interest to us.** We would therefore welcome any further comments from stakeholders on this topic.

At our CAWG meeting on 19 August 2021 we proposed that companies produce additional data to address a specific issue relating to the impact of Covid-19 on our econometric model for residential retail. Our further thinking on this is set out below.

7.1 The impact of Covid-19 on companies' provision of doubtful debt

We include companies' provision for doubtful debts in our assessment of companies' residential retail costs. Such provisions reflect the expectation of a future cost to the company from irrecoverable debt. Generally, such provisions should be a good reflection of bad debt costs.

Many companies increased their provision for doubtful debt in response to uncertainties caused by Covid-19. Our analysis of companies' data indicates that:

⁸⁹ CAWG, '[Residential retail](#)', 19 August 2021.

⁹⁰ Ofwat, '[Consultation on regulatory reporting requirements for new appointees in 2021-22](#)', July 2021.

- companies took significantly different approaches to setting their provision to doubtful debt; and
- irrecoverable debt has not generally increased and in many cases cash flows remain strong.

We are concerned that **the uncertainties around the impact of Covid-19 have made companies' provision for bad debt a poorer reflection of their actual costs in the short-term**. This could negatively affect the accuracy of our econometric modelling.

We could potentially address this issue if we had a more appropriate profile of costs.

We therefore intend to ask companies to provide additional data as part of their PR24 business plan tables. We would ask companies to separate out the part of their provision of bad debt costs to do with Covid-19 that was made outside of their standard methodology.⁹¹ We can then make a more informed decision about whether, for example, to:

- reprofile companies' costs based on this supplementary data;
- use smoothed data; or
- make no adjustment.

At this stage, we are interested to understand if companies have any comments regarding this approach and what guidance would aid companies to provide appropriate data.

7.2 Consultation questions

Residential retail cost assessment

26. Do you have any comments regarding our proposal to ask companies to separate out the part of their provision of bad debt costs to do with Covid-19 that was made outside of their standard methodology in the PR24 business plan tables?
27. What guidance would aid companies to provide appropriate data related to the provision of bad debt costs to do with Covid-19?

⁹¹ A standard methodology could be based on the total amount of trade receivables, how long debt is outstanding or some other mechanistic approach. A separate adjustment could, for example, be an additional uplift based on the concerns regarding Covid-19.

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